REPORT ON PUBLIC HEARING

RED RIVER FLOODWAY
EXPANSION

JUNE, 2005

MANITOBA
CLEAN ENVIRONMENT
COMMISSION

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CLEAN ENVIRONMENT
COMMISSION

COMMISSIONERS PRESIDING:

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May 31, 2005

Honourable Stan Struthers
Minister of Conservation
Room 330 Legislative Building
450 Broadway Avenue
Winnipeg, MB

Minister Struthers:

Re: Report on Public Hearing for the Red River Floodway Expansion Project

The Floodway Panel – Terry Sargeant, Wayne Motheral and Dr. Barrie Webster – is pleased to submit the Clean Environment Commission's report on the public hearing in respect of the Red River Floodway Expansion Project.

We are pleased to report to you that the Commission is in a position to recommend that the necessary environmental licences be issued to the the Manitoba Floodway Authority for the construction of the Red River Floodway Expansion Project and for the maintenance of the expanded Floodway and to the Department of Water Stewardship for the operation of the expanded Floodway, with conditions as set out in this report.

We would like to note that, without exception, Participants and Presenters respected the process and the points of view of others, in the end, adding considerable value to the environmental assessment process. We would also like to recognize the Proponent, the Manitoba Floodway Authority, for its willing cooperation throughout the many months of the pre-hearing and hearing process.

While the Commission heard many points of view, surprisingly few were in outright opposition to the project. Many presenters stated that they recognized the need for additional flood protection for the City of Winnipeg and expressed their ultimate support for the expansion of the Floodway. However, this support was conditional upon their very legitimate concerns being addressed prior to construction.

In this report, we address many of those concerns, describing the discussion that surrounded them and the conclusions reached by the Commission. Where we deem it necessary, we recommend that certain conditions be attached to the environmental licences which you will ultimately issue.

We also address a number of issues that were clearly outside of the Terms of Reference that you issued to the Commission, but which were of great concern to many of the Participants and Presenters. In many of these cases, we make some observations – described as "non-licensing recommendations" – which we believe will be of assistance to the Manitoba government in the case of future floods of the scale of 1997 or greater.

This report continues in the direction of the Wuskwatim report in making comments and observations that we believe will improve the process of environmental assessment in our province, thus ensuring that future developments are implemented in a manner that respects the principles and guidelines of the Sustainable Development Strategy for Manitoba.

To achieve this opportunity will require the full cooperation and efforts of the Commission, Proponents, Participants, and the Governments of Manitoba and Canada.

Minister, we thank you for the unique opportunity afforded us to participate in this public hearing into a matter of great concern to many Manitobans.

Sincerely,

Terry Sargeant, Chair

W Motheral

Wayne Motheral, Commissioner

Dr. Barrie Webster, Commissioner

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Foreword

During the course of the hearings into the proposed expansion of the Floodway, it became very clear that, for residents of the City of Winnipeg, this was virtually a "non-event". To them, the Floodway is a benign structure that serves to protect them, their homes and property from the ravages of a flooding Red River. They cannot contemplate that there might be any controversy attached to the project.

For many people who live outside of the Floodway, it is a very different story.

Many people whose homes are to the south of the Inlet Control Structure suffered flooding in 1997 *because* of the Floodway. Not only did it not protect them, it caused water levels to be higher than natural, resulting in their homes being flooded more severely than would otherwise have been the case.

Residents of rural municipalities along the northern part of the Floodway draw their water from local aquifers. Construction of the original Floodway, in the 1960's, cut into one of these aquifers resulting in an ongoing loss of high quality groundwater. Springs flowing into the Low Flow Channel of the Floodway, from the bedrock aquifer have also opened potential pathways for contaminants to enter a second source of groundwater.

These were two of the major concerns brought before the Clean Environment Commission during the hearing process. Hearing these – and other – concerns made us realize that the Floodway expansion project is not the simple excavation that many might perceive it to be.

It is, in fact, a very large construction project, which requires much, very complex engineering and which will include many, varied environmental concerns.

Notwithstanding this realization, the Commission recognizes that there are many benefits to the proposed expansion of the Floodway, and that the threat posed to Winnipeg by a flood larger than 1997 would be devastating to inhabitants of the city, as well as to the economy of the city and the province as a whole.

In our report on the public hearings for the Wuskwatim Generation and Transmission Projects, the Clean Environment Commission devoted a section to improving the process of environmental impact assessment in Manitoba. In noting that those hearings were the first time a proposal as large as a hydroelectric project had been subject to such review, we expressed our belief that there were opportunities for improvement, on the part of all parties.

The Wuskwatim report was not released until after the Environmental Impact Statement for the Floodway Expansion was made public. Accordingly, the Manitoba Floodway Authority (MFA) did not have the benefit of our advice in this regard.

One point made in the Wuskwatim report that is particularly germane to this and any future environmental assessment was our observation that "requiring higher standards of performance would enhance the practice of environmental assessment in Manitoba and make it more transparent for Manitobans."

This observation remains true. The Floodway hearings further underlined the need to raise the bar for environmental assessment.

For reasons that sometimes mystified Commission members and sometimes angered public participants, the MFA appeared to have assumed that, because there were so many upsides, there should be little concern about what it viewed as relatively few and minor downsides. This appeared to have led the MFA to take a narrow approach in conducting its environmental impact assessment.

The MFA put much effort into declaring, often arbitrarily, what it believed to be within the scope of the hearings and what was out of scope. One observer noted that, if the MFA had put as much effort into assessing environmental effects as it did in arguing why it didn't need to, the entire process would have gone more smoothly, more quickly and with less animosity.

Given that historically we strive to ensure that our hearings are as informal as possible, the Commission finds it unfortunate that the MFA took such a legalistic approach.

In spite of this rather narrow and somewhat legalistic approach, it must be acknowledged that the MFA did contribute immeasurably to the process by answering many questions and clarifying many issues brought forward by the participants and the Commission during the pre-hearing and hearing processes.

This hearing was one in which there was much value added by the process itself. The Participant Assistance Program, in particular, proved its worth. Six months prior to the commencement of the hearings, the Participant Assistance Committee, comprising three Commission members, considered applications for funding under the program, allocating a total of $300,000 to seven organizations.

Each of the funded-participants engaged consultants, expert advisors and/or legal counsel of high calibre. In addition, the rural municipalities of East St. Paul, St. Clements and Springfield, though unfunded, jointly, engaged expert and legal advisors. Furthermore, the Commission engaged engineering and environmental consultants to assist us throughout the review process.

These consultants contributed considerably to the discussion and review of potential environmental impacts. They also contributed to the Commissioners' understanding of these impacts. This input greatly assisted the Commission in coming to our conclusions. Had it not been for the involvement of the public participants, their consultants, as well as those engaged by the Commission, we might not have been able to fully understand the complexities of the project. This would have made it extremely difficult to recommend the issuance of an environmental licence.

At the end of the process, the Commission is in a position to recommend to the Minister of Conservation that the necessary environmental licences be issued to the the Manitoba Floodway Authority for the construction of the Red River Floodway Expansion Project and for the maintenance of the expanded Floodway and to the Department of Water Stewardship for the operation of the expanded Floodway. This recommendation is not unconditional, however. We also recommend a number of conditions that, in our view, must be attached to these licences.

This report also deals with some matters that are clearly outside of the mandate given us by the Minister of Conservation in the Terms of Reference for these hearings. For the most part, these matters relate to issues in respect of the 1997 flood.

In raising these issues, the participants and presenters admitted that they were out of the scope of our review. On the other hand, the Commissioners were of one mind that these participants and presenters deserved the opportunity to express their concerns. We discuss many of these concerns in this report and offer advice in their regard. The overriding message that we received from these presentations was that, on the part of many persons affected by the 1997 flood, there continues to exist a heightened sense of distrust of government and government agencies.

We are of the view that, while beyond our mandate, any advice we might offer in this regard may well be helpful to government and the MFA.

particularly in the case of a future severe flood.

These observations are presented as "non-licensing recommendations" only and do not form part of the licensing conditions.

I would like to acknowledge the contribution of my co-panelists, Wayne Motheral, of Morden, and Barrie Webster, of Winnipeg. Their endeavours in addressing an issue of great import to Manitoba were considerable. I would also like to thank Commission staff members, Cathy Johnson and Joyce Mueller for their skills and dedication. And, a final thanks to our team of consultants, without whom we would have had great difficulty navigating through this process. Key players on this team were Doug Abra, Dave Farlinger, Doug Smith and Harold Westdal. They were very ably supported by Fred Claridge, Tad Dabrowski, Don MacIntyre, Ken Mills, Wim Veldman and Stan Williams.

Terry Sargeant, Chair

May 2005

Executive summary

The Manitoba Clean Environment Commission (the Commission) conducted a public hearing into the Red River Floodway Expansion Project from February 14 to March 10, 2005. The Commission's mandate required it to consider the Environmental Impact Statement (EIS) on expansion that had been prepared for the Manitoba Floodway Authority (MFA) and public concerns in reviewing potential environmental, socio-economic, and cultural effects of Floodway expansion. Based on these considerations, it was to recommend on whether the expansion should be licensed under *The Environment Act of Manitoba*. The Commission was also mandated to make recommendations in regard to:

- Measures proposed to mitigate any adverse environmental, socio-economic, and cultural effects resulting from the Red River Floodway Expansion project and where appropriate, to manage any residual adverse effects; and
- Future monitoring and research that may be recommended in relation to the project.

Commission recommendations were to incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *Sustainable Development Strategy for Manitoba*.

Floodway expansion involves widening the Floodway Channel, modifying and replacing the bridges that span the Channel, making improvements to the Inlet and Outlet Control Structures, and extending and raising the West Dyke. The expanded Floodway would provide the City of Winnipeg with protection against what is described as a 1-in-700-year flood.

Licensing recommendations

Having reviewed the EIS and the testimony presented at the hearing, the Commission is recommending that licenses under *The Environment Act* be issued to the MFA for the construction of Red River Floodway Expansion Project and for the maintenance of the expanded Red River Floodway and to Manitoba Water Stewardship for the operation of the expanded Red River Floodway.

The Commission is also recommending that conditions be attached to the above licenses. These conditions relate to operating rules, groundwater quality and quantity, the safety of the Floodway Inlet Control Structure, and the recreational uses of the Floodway right-of-way.

Operating rules and compensation for artificial flooding: The Floodway operating rules determine the water levels both inside the City of Winnipeg and upstream of the Floodway Inlet Control Structure. In so doing, they determine whether upstream residents will be subject to artificial flooding and the degree of any artificial flooding. The rules must be clear, publicly agreed upon, and adhered to. Further, compensation for artificial flooding should be provided in a consistent manner. The Commission is recommending that the Floodway operating rules be subject to regular public review, that the Floodway be operated in accordance with those rules, and that there be third-party review of the provincial determination as to whether or not artificial flooding had occurred. It is also recommending that compensation for damages caused by artificial flooding be assessed on a consistent basis, whether the flooding arose as a result of spring emergency operations or non-spring emergency operations.

Groundwater: The existing Floodway intercepts the flow of regional aquifers and reduces local groundwater quantity. It also represents a potential pathway between contaminated river water and potable water in two regional aquifers. The Commission is recommending that the MFA establish comprehensive water quantity and quality baselines, develop a comprehensive ongoing groundwater-monitoring program, ensure that there is no increase in groundwater leakage into the Floodway, carry out a comprehensive Floodway-related health-risk assessment, and establish procedures and protocols to deal with adverse water quantity and quality effects for all phases of Floodway construction and operation. The Commission is also recommending that there be an arms-length appeal body to adjudicate claims regarding groundwater issues. The plans for the above should be subject to peer review and an annual report should be published on Floodway water quality.

Floodway Inlet Control Structure Gates: When the Inlet Control gates are raised they function as a dam, reducing the flow of water into Winnipeg. Should they fail, or should the foundation on which they sit shift, the implications could be catastrophic. The Commission is recommending investigations and monitoring of the Inlet Control Structure foundation, a dam safety monitoring plan, a review of the need for backup gates, a review of a discussion paper on dam safety, implementation of the recommendations of a report on dam safety, preparation of a dam safety review plan, and the carrying out of any work that is identified as a result of these reviews.

Recreation: While the MFA declared that recreation was out of scope, given the community interest in healthy living and aesthetic public works, the Commission is supportive of landscaping and recreational use of the project. The Commission is recommending that the MFA work with interested parties to develop a recreation and landscaping plan for the Floodway, develop a draft recreation and landscaping plan suitable for public presentation no later than the spring of 2006, set aside no less than one percent of the total Floodway budget for the development and implementation of a Recreation Master Plan, and ensure safe passage for cyclists and pedestrians over and under each structure and/or facilitate safe passage by alternative means consistent with trail plans.

Non-licensing recommendations

Aside from the above licensing recommendations, the Commission is making additional recommendations in a number of areas. These call for regular review of the Floodway operating rules, fair and consistent compensation for artificial flooding, further study of ice jamming downstream of the Floodway, investigation into the Floodway's impact on riverbank stability, impovements in rural drop structures, the need for upgrades to the City of Winnipeg's flood protection levels, and improved provincial flood preparedness.

Chapter 1

Introduction

1.1 Manitoba Clean Environment Commission

The Manitoba Clean Environment Commission (the Commission) is an arms-length provincial agency established under the authority of *The Environment Act* of Manitoba. The Commission encourages and facilitates public involvement in environmental matters, and offers advice and recommendations to the Government of Manitoba on sustainable development, environmental issues, and licensing matters. Its mandate is exercised through public hearings, investigations, mediation, and education. The Commission consists of a full-time Chairperson and part-time Commissioners appointed by Order-in-Council.

1.2 The Red River Floodway and its proposed expansion

The current Manitoba Floodway protection system consists of the following five elements:

- The Floodway Channel: a 48-kilometre[1]-long channel running from south of St. Norbert to north of Lockport.
- The Floodway Inlet Control Structure: this structure spans the Red River, downstream from the entrance to the Floodway Channel. It houses two hydraulically operated gates that raise the water levels in the Red River upstream of the structure, thereby diverting floodwaters into the Floodway.
- The Floodway Outlet Structure: situated at the north end of the Floodway Channel, downstream of Lockport, this structure dissipates the excess energy of flood flow as it returns to the Red River.
- The West Dyke: a dyke that runs 45 kilometres from the Red River to high ground on the west side of the Red River Valley. It prevents floodwaters from entering Winnipeg from the west side of the Floodway Inlet Control Structure.
- The Portage Diversion (sometimes referred to as the Assiniboine River Diversion) and the Shellmouth Dam. The Portage Diversion diverts a portion of the flow of the Assiniboine River into Lake Manitoba, while the Shellmouth Dam reduces spring flow in the Assiniboine River.

Following the 1997 flood in the Red River Valley, a series of studies and flood-proofing initiatives were undertaken relating to flood protection in the valley. In 2003, the governments of Canada and Manitoba announced that they would each be contributing $80-million as part of an agreement to expand the Red River Floodway. At the time it was estimated that the total cost of Floodway expansion would be $660-million.

In April 2003, the Manitoba government

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[1] Throughout this report measures will be provided in metric terms. The only exceptions will be for certain measures that are referenced as imperial measures in current rules and regulations. In those cases, the measure will be expressed in both the metric and imperial systems.

established the Manitoba Floodway Expansion Management Authority (MFEMA) to oversee the Floodway expansion project. In October 2003, this agency was renamed the Manitoba Floodway Expansion Authority (MFEA). In 2004, *The Floodway Authority Act* established the Manitoba Floodway Authority (MFA) as a Crown corporation charged with the responsibility of expanding the Red River Floodway. The MFA was also charged with the responsibility of obtaining all necessary licensing and regulatory approvals for such an expansion. It is proposed that Manitoba Water Stewardship will operate the Floodway, both during and after expansion.

As currently proposed, Floodway expansion involves widening the Floodway Channel, modifying or replacing the bridges that span the Channel, making improvements to the Inlet Control and Outlet Structures, and extending and raising the West Dyke. The existing Floodway and the proposed expansion are described in detail in Chapters 2 and 3 of this report.

1.3 Terms of reference

In September 2003, the Minister of Conservation issued terms of reference to the Commission (Appendix A) to conduct a public hearing into the Red River Floodway Expansion Proposal (the Project). The terms of reference stated that:

> For the potential environmental, socio-economic, and cultural effects of the Proposal, the Commission shall consider the Environmental Impact Statement and public concerns, and provide a recommendation on whether an *Environment Act* Licence should be issued to the Floodway Expansion Management Authority for the Red River Floodway Expansion Proposal.
>
> Should the Commission recommend the issuance of an *Environment Act* Licence for the Proposal, then appropriate recommendations should be provided respecting:
>
> - Measures proposed to mitigate any adverse environmental, socio-economic, and cultural effects resulting from the Red River Floodway Expansion project and where appropriate, to manage any residual adverse effects; and
> - Future monitoring and research that may be recommended in relation to the project.
>
> The Clean Environment Commission's recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *Sustainable Development Strategy for Manitoba.*

1.4 Public hearing

Public hearings, as facilitated by the Commission, are integral to Manitoba's environmental review process. At these hearings members of the public have an opportunity to ask questions of proponents, explain their experiences with other projects owned and operated by the proponent, and, with assistance from the Participant Assistance Program, hire expert witnesses to review technical documents and provide the Commission with informed critical opinion both through their testimony and their written submissions. In short, it allows for an informed debate and discussion of serious public-policy matters.

In accordance with the terms of reference, the Commission established a three-person panel composed of Commission chair Terry Sargeant (who also served as the chair of the panel), Wayne Motheral, and Dr. Barrie Webster. Commencing on February 14, 2005 and concluding on March 10, 2005, the panel sat for 16 days in Winnipeg and Oakbank, Manitoba. For a full list of the people who presented at the hearing see Appendix B.

Under *The Environment Act* Participant Assistance Program, $300,000 was made available to groups and individuals participating in the Commission environmental hearing process examining Floodway expansion. The following organizations received funding:

- The 768 Association, Inc.
- Coalition for Flood Protection North of the Floodway.
- The Cooks Creek Conservation District.
- The Peguis Indian Band.
- Ritchot Concerned Citizens Committee.
- Rivers West – Red River Corridor Association, Inc.
- Save Our Seine.

1.5 Regulatory framework

Because Floodway expansion requires a variety of federal and provincial approvals, it is being reviewed under the provisions of the Canada-Manitoba Agreement on Environmental Cooperation in a process that respects each jurisdiction's relevant legislation. *The Environment Act* (Manitoba) sets out the Manitoba government's licensing requirements. Under *The Environment Act*, Floodway expansion is a Class 3 Water Development and therefore requires approval from the minister responsible for *The Environment Act*. The need for federal *Fisheries Act* authorizations and *Navigable Waters Act* permits requires that the Project receive a *Canadian Environmental Assessment Act* screening level assessment. (A screening is an environmental assessment that includes a consideration of factors set out in subsection 16.(1) of the *Canadian Environmental Assessment Act* (CEAA)). A draft of the screening report for the Floodway expansion was made available for public review in May 2005.) Because of its financial contribution to the expansion of the Floodway, Infrastructure Canada has been designated the federal Responsible Authority under the CEAA. As the Responsible Authority, Infrastructure Canada is required to ensure that an environmental assessment of the project is conducted.

A joint Project Administration Team (PAT), with Manitoba as the lead jurisdiction, was established to manage the cooperative environmental assessment. It included representatives of Manitoba Conservation, Manitoba Agriculture, Manitoba Culture, Heritage and Tourism, Manitoba Health, Manitoba Transportation and Government Services, Manitoba Industry Trade and Mines, Manitoba Intergovernmental Affairs, the Cooks Creek Conservation District, the Lasalle Redboine Conservation District, Infrastructure Canada, Fisheries and Oceans Canada, Transport Canada, the Canadian Transportation Agency, Western Economic Diversification Canada, Natural Resources Canada, Environment Canada, Parks Canada, Agriculture and Agri-Food Canada, Public Works and Government Services Canada, and Indian and Northern Affairs Canada. A Technical Advisory Committee (TAC) was also established and given responsibility for the technical environmental review of the project.

The Manitoba Floodway Expansion Management Authority submitted an *Environment Act* proposal form for the expansion to Manitoba Conservation in July 2003. This document was placed in the public registry for public review. In August 2003, the PAT released its draft *Guidelines for the Preparation of an Environmental Impact Statement for the Red River Floodway Expansion Project*. An advertisement was placed in local newspapers inviting public comment on the project and the guidelines. The final guidelines were released in February 2004, placed in various public registries, and reviewed by the TAC.

The MFA commissioned a team of consultants to conduct an assessment of the environmental impacts of the proposed project. The resulting Environmental Impact Statement (EIS) was submitted to the PAT in August 2004, when it was made available to members of the public, members of the TAC, and Aboriginal persons for comment. Members of the public were provided with a 60-day period to make comments on the EIS. On November 1, 2004, the chairperson of the PAT provided the MFA with comments regarding the draft EIS. On November 29, 2004, the MFA submitted a supplementary filing to the EIS. In January 2005, the chairperson of the PAT wrote to the chairperson of the Commission recommending that the Commission schedule public hearings in regard to the proposed expansion.

As noted in its mandate, the Commission's role is to make recommendations on the granting of a licence under *The Environment Act*. In making its determination as to the effects of the Project and recommendations, the Commission relied on the EIS, technical experts retained by the Commission, participant and public presentations, testimony of expert witnesses, and cross-examination of those experts.

The Commission was required to submit its report within 90 days of the close of the hearing. Should the Commission recommend the granting of a license, the Minister of Conservation must either adopt the Commission licensing recommendations or provide written reasons for rejecting them.

1.6 Key questions

Before proceeding to a discussion of the specific issues raised by the filings and hearings, three important questions require comment.

1.6.1 Who is the Proponent of this Project?

This question arises from the fact that while the MFA has taken on responsibility for acquiring all necessary licenses and approvals for this project and will be responsible for the construction of the expansion and maintenance of the expanded Floodway, Manitoba Water Stewardship will continue to operate the Floodway. While a representative of Manitoba Water Stewardship attended much of the Commission hearing and answered numerous questions about past, present, and future Floodway operations, Manitoba Water Stewardship was not a formal proponent of the expansion. The Commission is taking the position that while the MFA is the main project proponent, Manitoba Water Stewardship is a co-proponent.

1.6.2 How many licenses are being requested?

In testimony at the hearing the MFA indicated that it was applying for two licenses under *The Environment Act*. The first would be to construct the expansion to the Floodway (and maintain the expanded Floodway), the second would be to operate the expanded Floodway. It also indicated that it expected in some manner, to delegate this second license to Manitoba Water Stewardship. The manner in which this delegation might take place was not clear—indeed at one point, the MFA stated that it believed the issue of how many licenses should be granted was a technical issue that might be best left to the Minister of Conservation, who has responsibility for the administration of *The Environment Act*. Licences under *The Environment Act* are granted to specific organizations, granting them the right to build or operate specific projects according to specific regulations. To ensure proper public accountability, a licence should be granted directly to the agency that will have the responsibility of fulfilling the conditions of the licence. For these reasons, the Commission position is that two licences are required: one to allow for the construction of the expansion and the maintenance of the expanded Floodway and one for the operation of the Floodway. The first licence, if it is granted, should be granted to the MFA, the second to Manitoba Water Stewardship.

1.6.3 What is the Project that is being assessed and licensed?

Environmental assessment of a major infrastructure project such as the Red River Floodway did not commence in Manitoba until the passage of *The Clean Environment Act* in 1969. This Act was subsequently replaced with *The Environment Act* of 1988. Neither of these acts were retrospective in nature—projects that were already in existence were not required to undergo a licensing procedure and were essentially grandfathered. As a result, there is no current license under *The Environment Act* for the existing Floodway. In the matter of the construction phase of Floodway expansion, it is clear that the project to be assessed and licensed is the physical expansion of the Floodway. During the course of the public hearing, there was no disagreement on this point. Since this expansion will create a single, expanded Floodway, it is also clear that any operating license granted under provisions of *The Environment Act* must apply to the expanded Floodway, not simply the expansion of the

Floodway. There was considerable debate at the hearing, however, as to whether the assessment of effects should be limited to the effects of Floodway expansion or whether the effects of the previously grandfathered existing Floodway should be not only described but assessed. The Commission presents its conclusions on these issues in Chapter 4.

1.7 Report

This report to the Minister of Conservation presents an overview of the Project, the regulatory context of the Project, a summary of the hearings, and provides comments and recommendations on environmental issues of concern as identified by the public and technical advisors to the Commission.

The Commission has developed an understanding of the effects of the Project adequate to recommend to the Minister that the Project receive all necessary licences under *The Environment Act* to construct, operate, and maintain the Floodway, subject to specific conditions to be attached to those licences. These conditions address concerns about public health, safety, consultation, mitigation of artificial flooding, and monitoring of surface and groundwater. These recommendations will be identified as licensing recommendations.

In addition to these licensing recommendations, the Commission is also making a number of recommendations in relation to compensation, flood protection, and the environmental assessment process. The recommendations will be identified as non-licensing recommendations.

Licensing recommendations

1.1 The Manitoba Floodway Authority be issued a licence to construct the proposed expansion of the Red River Floodway and maintain the expanded Red River Floodway, subject to licensing conditions outlined in subsequent recommendations in this report.

1.2 Manitoba Water Stewardship be issued a licence to operate the expanded Red River Floodway, subject to licensing conditions outlined in subsequent recommendations in this report.

Chapter 2
Current flood protection for Winnipeg

The flood of 1950 was the first catastrophic flood to hit the Red River Valley following the urbanization and industrialization of the late nineteenth and early twentieth centuries. Following that flood, governments at all levels combined to establish a variety of flood protection measures, particularly for the protection of the City of Winnipeg. This chapter outlines those measures and contains sections describing:

- Key Manitoba flood protection projects.
- The Red River Floodway.
- Operating rules for the Floodway.
- Operations of the Floodway.
- City of Winnipeg flood protection infrastructure.

During the hearings, a number of contentious points were raised regarding aspects of the operation of the existing Floodway. These issues will be more fully explored in subsequent chapters of this report. The purpose of this chapter is simply to introduce the basic components of flood protection for the City of Winnipeg.

2.1 Key Manitoba flood protection projects

The Red River Floodway is one of three major flood protection projects that were planned and constructed between 1962 and 1972 following the 1950 flood in the Red River Valley. (Figure 2-1) The three projects were:

1. The Red River Floodway. The Floodway was designed to divert 1,700 cubic metres per second (m^3/s) while maintaining a water surface elevation on the Red River at the Floodway Channel entrance of 234.77 metres above sea level (ASL). The Floodway extends from the Red River south of Winnipeg to the east of the city, discharging into the Red River at Lockport. The project was completed in 1968 at a cost of $63-million and first operated during a spring flood in 1969.
2. The Portage Diversion (also referred to as the Assiniboine River Diversion). This 700 m^3/s diversion channel was designed to carry floodwaters from the Assiniboine River immediately upstream of Portage la

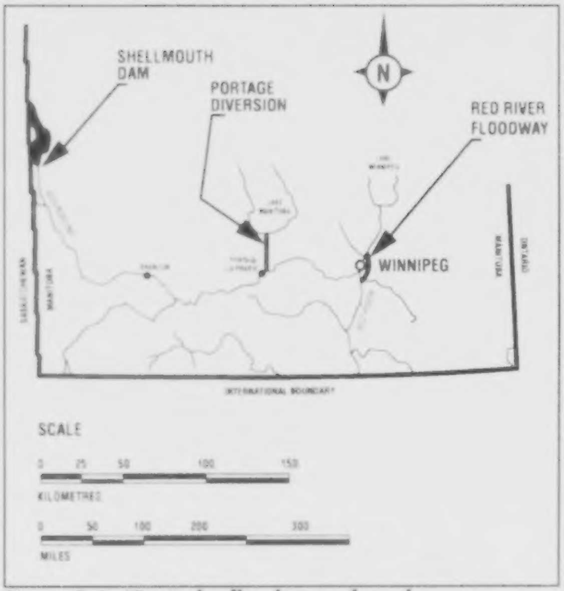

Figure 2-1: Manitoba flood control works

Prairie northward to Lake Manitoba. It was completed in 1970 at a total cost of $20.5-million. It provides flood protection to Winnipeg, Portage la Prairie, the area adjoining the Assiniboine River between those cities, and the area North of Winnipeg along the Red River to Lake Winnipeg.

3. The Shellmouth Dam. This dam on the upper reaches of the Assiniboine River just north of Russell stores floodwaters and reduces flow peaks downstream by 200 m³/s. It was completed in 1972 at a cost of $10.8-million. The reservoir provides protection over the entire reach of the Assiniboine River between the Shellmouth Dam and its confluence with the Red River at Winnipeg and north of Winnipeg along the Red River.

When combined, these three projects were intended to protect Winnipeg against a flood whose flow would be 4800 m³/s measured just downstream of the juncture of the Red and Assiniboine Rivers.

2.2 The Red River Floodway

There are four main components to the Red River Floodway (Figure 2-2):

- The Floodway Diversion Channel.
- The Inlet Control Structure.
- The Outlet Structure.
- The West Dyke.

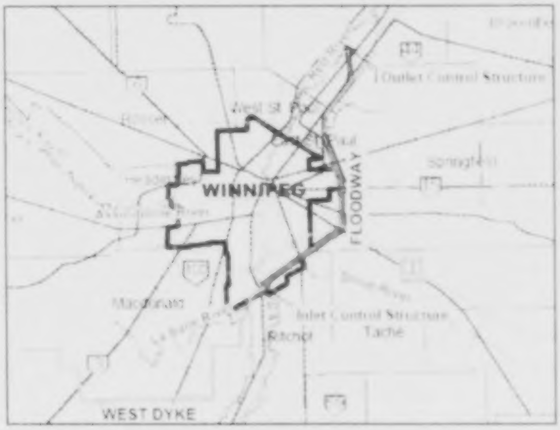

Figure 2-2: Components of Red River Floodway.

2.2.1 Floodway Diversion Channel

The Existing Floodway Channel extends approximately 48 kilometres, with an average channel depth of 9.1 metres, except through the Birds Hill ridge, where the depth increases to 20.1 metres. The channel has a longitudinal slope of 8.6 centimetres per kilometre upstream of Bird's Hill and a slope of 16 centimetres per kilometre downstream of Birds Hill.

The Floodway Channel passes through a region that contains two aquifers used to supply local communities with water. (An aquifer is an underground layer of permeable rock or sand that serves to store water and can act as a water supply.) The largest aquifer is the confined aquifer located in the carbonate (or limestone) bedrock. This aquifer is present throughout the region. (Figure 2-3) The second aquifer is the smaller unconfined Birds Hill aquifer, which is contained in a large sand-and-gravel deposit, an esker remaining from the last ice age about 10,000 years ago. (A confined aquifer has an impermeable overlay, an unconfined aquifer has an overlay of permeable materials.) Groundwater flows through these aquifers from east to west, towards the Red River. (On the west side of the

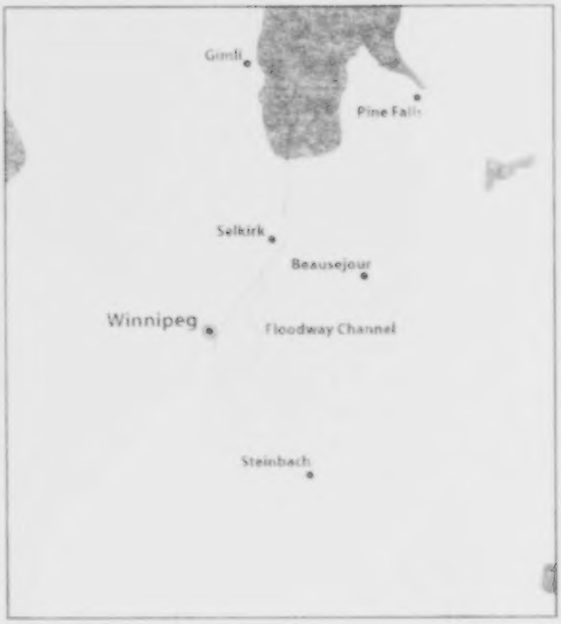

Figure 2-3: Aquifer areas with a flow rate greater than 0.4 litres per second.

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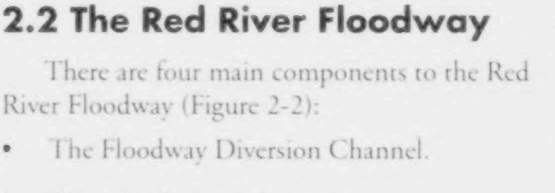
Brokenhe
Red River
Outlet Control Structure
West St. Paul
Rosser
St. Paul
Springfield
Headingley
WINNIPEG
Assiniboine River
FLOODWAY
Seine River
Macdonald
La Salle River
Inlet Control Structure
Ritchot
Taché
WEST DYKE

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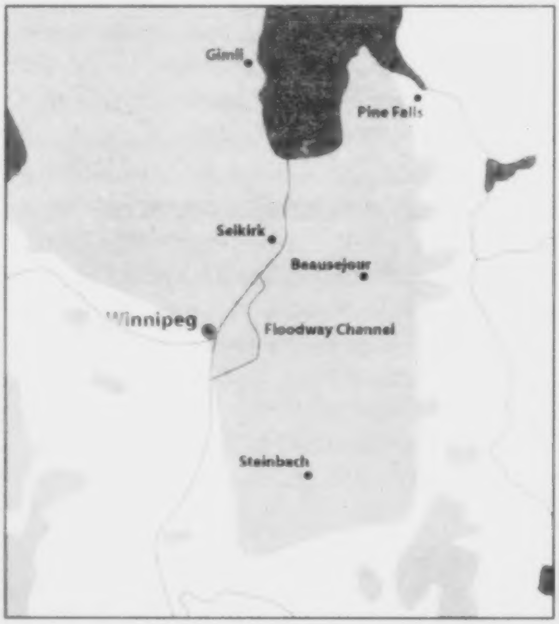
Gimli
Pine Falls
Selkirk
Beausejour
Winnipeg
Floodway Channel
Steinbach

Figure 2-3: Aquifer areas with a flow rate greater than 0.4 litres per second.

Red, the groundwater tends to flow, from west to east, again, towards the Red River.) A third aquifer located in the deep sandstone underlying the carbonate aquifer is not widely used as a source of water supply.

The current Floodway Channel is constructed through a region underlain by some 5-to-20 metres of glaciolacustrine clay deposits (glaciolacustrine clays are clays deposited on the shore and beds of glacial lakes and are of very low permeability). The top layer consists of weathered brown clay approximately 3-to-5 metres thick. This is an important feature as the weathered clay is fractured, with the cracks providing greater permeability than the underlying grey clay. Beneath the clay is a silt and sandy till (unsorted material deposited directly by glacial ice) that contains sand lenses (sand lenses are bodies of sand within the till in places where a small stream once flowed). In the more northerly two-thirds of the channel, the till and clay overlie the carbonate bedrock aquifer, often as little as a few metres thick in places. The brown and grey clay described above overlies the most southerly third of the channel.

During excavation of the existing Floodway Channel, the Channel cut through (or intercepted) the unconfined sand-and-gravel aquifer and groundwater from that aquifer began to flow into the Channel. At the time, a clay plug was constructed on both sides of the channel to reduce the loss of valuable groundwater. The construction of the Channel also left the carbonate aquifer with only a few metres or less of cover in certain locations. Water pressure from the carbonate bedrock aquifer pushed water from the aquifer up into the Channel. This created small springs (often referred to as blowouts) in the bottom of the Low Flow Channel along the Floodway from the Trans-Canada Highway northward. Both the interception of the sand-and-gravel aquifer and the springs that take water from the bedrock aquifer result in the discharge of valuable high-quality groundwater from the carbonate aquifer to the Floodway Channel. Over time the water tables in both aquifers were lowered by up to 6 metres and the effect on the water table was noted as far as 10 kilometres to the east.

The Floodway Channel is contained within two embankments that were constructed from soil excavated during Floodway construction. The East Embankment (on the easterly side of the Floodway Channel) does not serve a flood protection role. The West Embankment runs north from the Provincial Trunk Highway 59 South Bridge to the Floodway Outlet Structure. At the Provincial Trunk Highway 59 South Bridge, the West Embankment connects with the East Dyke, which extends from the bridge to the Floodway Inlet Control Structure.

The Floodway Channel was designed to convey 1,700 m^3/s while maintaining a water surface elevation at the entrance to the Floodway of 234.77 metres ASL. Based on data from 1969 to 1999 this channel capacity has been re-estimated to be 1,750 m^3/s when the water surface elevation of the Red River at the Floodway Channel entrance is 234.77 metres ASL. With the bridges in place, the ultimate capacity is estimated to be 2,500 m^3/s for a level of 237.13 metres ASL at the Floodway Inlet. If the bridge crossings were removed or raised, the ultimate capacity of the channel itself would be close to the original estimated channel capacity of 2,800 m^3/s.

The Low Flow Channel (also known as the pilot channel) is the channel situated at the bottom of the Floodway Channel. When the Floodway is not in operation, it is the only portion of the Floodway with any flow. In those conditions, the depth of water in the channel varies between 1.0 metre and 2.0 metres.

The inlet to the Floodway Channel is located in the eastern bank of the Red River near St. Norbert. An earthen weir or lip (228.6 metres ASL and 2.1 metres above the Floodway Channel bottom) at the Floodway entrance prevents river ice from entering the Floodway Channel. (Ice is not desired in the Floodway Channel because it can jam against bridge crossings, resulting in blockages that reduce Floodway capacity.) Water flows in the Red River start to enter the Floodway when the Red River flow exceeds 850 m^3/s.

Following the 1997 flood, concerns over constrictions near the entrance of the channel led to a decision to cut two gaps in the East Embankment. The West Gap is 3 kilometres from the inlet on the Red River, and the East Gap is

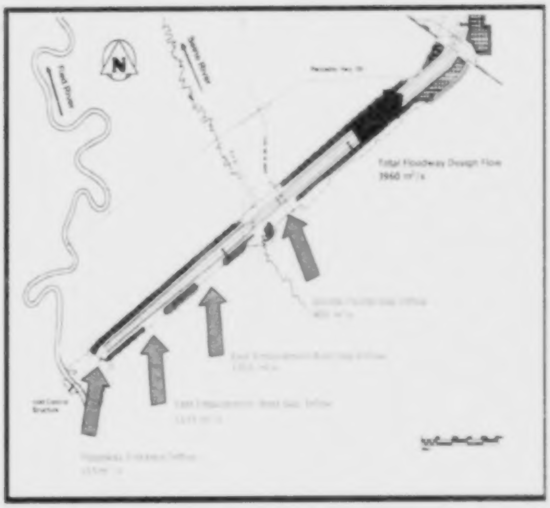

Figure 2-4: Gaps in the East Embankment.

5 kilometres from the inlet. These gaps serve as additional inlets to the Floodway during extreme flood conditions. (Figure 2-4 shows these two gaps along with the proposed Grande Pointe Gap.)

Currently there are 25 forage leases and 10 haying and cropping leases for land on the Floodway embankment.

The channel is spanned by seven highway bridges, six railway bridges, and one low level crossing. It is also crossed by a series of aqueducts and utility lines, and a syphon that carries a portion of the flow of the Seine River under the Floodway Channel. Six agricultural drains from lands east of the Floodway empty into the Floodway Channel through a number of a drop structures. (A drop structure is a structure to take water from a higher elevation to a lower elevation without causing erosion.) In addition, one City of Winnipeg storm sewer outfall, the Grande Pointe drain, the Deacon Reservoir drain and the Country Villa estates drain empty into the Floodway Channel.

2.2.2 Inlet Control Structure

The Inlet Control Structure spans the Red River just downstream from the Floodway Channel entrance. The foundation of the concrete control structure rests on limestone bedrock. The structure houses two independent steel gates, each with its own flow channel. A central concrete pier that supports the Inlet Control Structure bridge deck and the control room separates the gates. During non-operational conditions, the gates rest in a fully down position, with the top of the gates at elevation 221.9 metres ASL, level with the river bottom. On either side of the structure are earth-filled embankments. (Figure 2-5 show the Inlet Control Structure.)

By raising and lowering the gates, it is possible to regulate the Red River water level at the entrance of the Floodway Channel, thereby controlling Red River flow through the City of Winnipeg. Raising the gates raises water levels upstream of the Inlet Control Structure, increasing flow into the Floodway Channel.

The machine room containing the gate motors is at an elevation of 237.7 metres ASL, meaning that the mechanism is not endangered when water levels at the inlet are regulated to 237.1 metres (778.0 feet) ASL.

2.2.3 Outlet Structure

The Floodway water level declines a total of 5 metres from its inlet to outlet, while the Red River declines by approximately 10 metres between

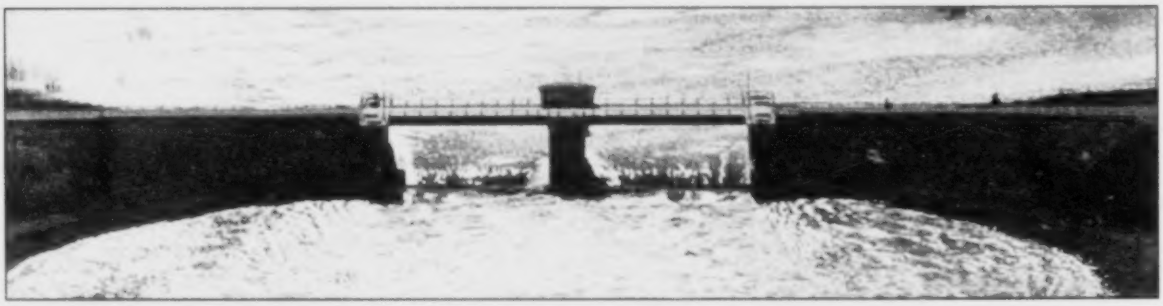

Figure 2-5: Inlet Control Structure viewed from downstream.

those two points. Without a structure to dissipate the energy created by the 5-metre drop from the Floodway to the Red River, the river channel and the outlet channel would both be subject to erosion.

The concrete Floodway Outlet Structure rests on a bedrock foundation with an uncontrolled rollway. (A rollway is the portion of the structure downstream of the weir or crest of the structure.) It is described as being uncontrolled because there are no gates or other controls for the flow over the crest. The Outlet Structure is 48.8-metres wide and has a 37-metre-long stilling basin that contains the high velocity water as the energy is dissipated. The length of the structure is 60.2 metres.

2.2.4 Dykes

Dykes have been constructed on either side of the Inlet Control Structure to prevent floodwaters from bypassing the structure. On the east side of the Red River, the East Dyke extends parallel to the Floodway Channel for a distance of 9.7 kilometres ending at Provincial Trunk Highway 59 South Bridge.

The West Dyke is intended to prevent the floodwaters of the Red River from the south-west from bypassing the Floodway, by flowing into the LaSalle River watershed and through the LaSalle River into the Red River within the City of Winnipeg. In 1969 the West Dyke was constructed to a length of 33.2 kilometres. During the 1997 flood, the West Dyke was raised and temporarily extended an additional 35 kilometres to prevent floodwaters from bypassing the structure and entering the City. Following the 1997 flood, the temporary extension, which ran to the northwest, was abandoned and the dyke was extended an additional 11.8 kilometres to the west. Including this extension, the current length of the West Dyke is 45 kilometres.(See Figure 2-6.)

2.3 Operating rules for the Floodway

The Floodway is operated according to a set of rules issued under the general authority of *The Water Resources Administration Act*. The intent of the operating rules is to maintain water levels

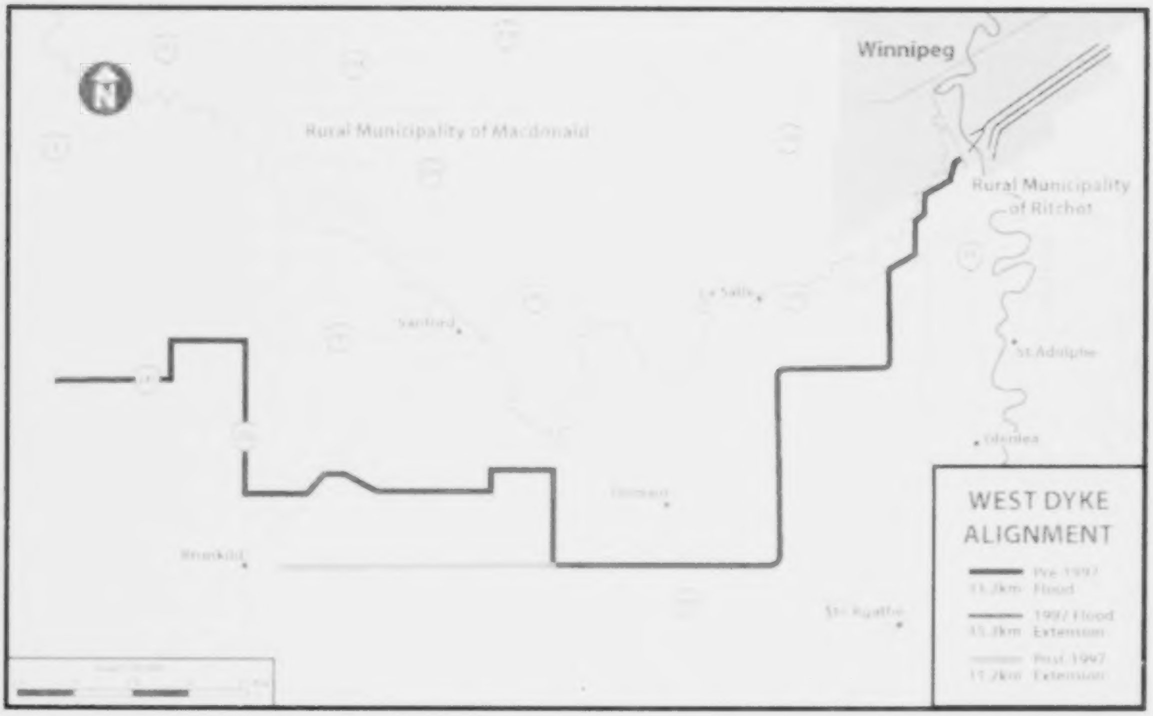

Figure 2-6: Existing West Dyke

upstream of the Inlet Control Structure at or below what is known as the natural level until Winnipeg is threatened with major flooding. When Winnipeg is threatened with serious flooding, the emergency rules allow for the raising of water levels upstream of the Inlet Control Structure above the natural level. These above natural water levels are referred to as artificial flooding.

The concept of natural water levels and artificial flooding are two of the most controversial issues associated with the Floodway and Chapter 6 of this report is devoted to a discussion of these issues. When used in connection with the Floodway, the term natural refers to what the water levels would be if the various flood protection measures constructed to reduce flooding in the City of Winnipeg had not been constructed. Furthermore, it excludes the impact of various developments in the City of Winnipeg, particularly bridges, which have the effect of raising the water level.

There is no one single natural level for any given point along the Red River—instead the natural level rises and falls in relation to the general flow conditions and is generally expressed as a rating curve. The rating curve that determines the natural level for the various river flows was reviewed following the 1997 flood. The reviewers concluded that there was a divergence between the 1965 rating curve that had been used to define natural and the reviewers' computation of the natural, which was based on a better understanding of hydrology plus the data that had been gathered in the in the intervening years on river flow. In 2004, the Manitoba government adopted a new rating curve based on the work of the Acres Manitoba Limited consulting firm. It should be noted that all the predictions that the Manitoba Floodway Authority (MFA) made to the Commission hearing were based on the 2004 Acres Manitoba Limited rating curve. This issue is further discussed in Chapter 6.

It might first appear that the natural level for the Floodway would simply be the water level for any given rate of flow as long as the Floodway gates are not in operation. (Recall that when the Floodway gates are operated, they create a backflow that raises upstream water levels.) This would be correct if it were not for the fact that a number of flood control structures can lower upstream water levels, even if the Floodway is not in operation. The three structures that have this impact are the Floodway Inlet itself, the Shellmouth Dam and Reservoir, and the Portage Diversion.

During periods of high flow on the Red River, water begins to naturally flow into the Floodway Channel. Because there are now two channels for water to follow, river levels upstream of the Inlet Control Structure are reduced below natural levels. The Shellmouth Dam and the Portage Diversion reduce the flow of the Assiniboine River into the Red River during floods, thereby also

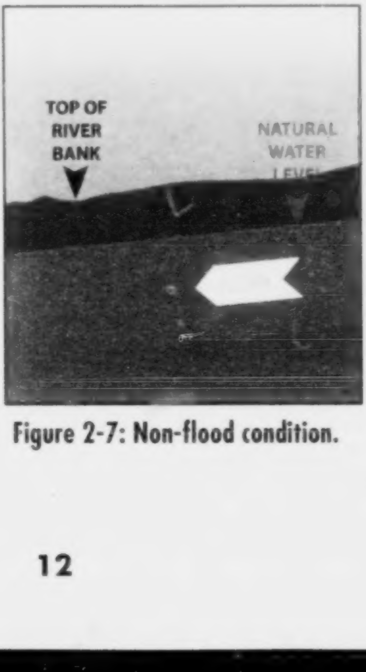

Figure 2-7: Non-flood condition.

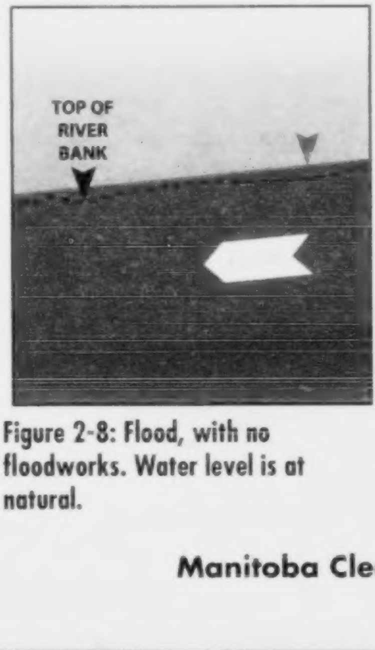

Figure 2-8: Flood, with no floodworks. Water level is at natural.

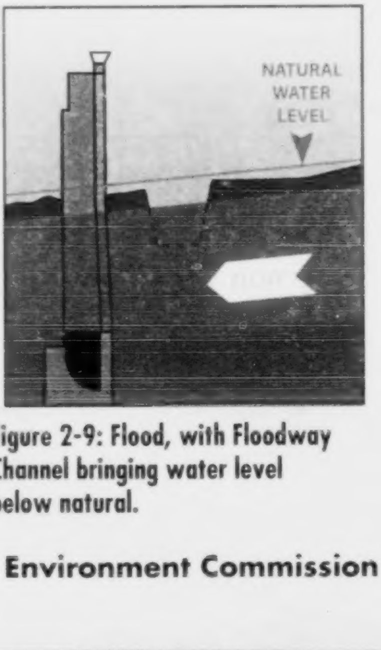

Figure 2-9: Flood, with Floodway Channel bringing water level below natural.

reducing the water levels in the Red River as far south as the Inlet Control Structure to levels that are below natural.

This means that the Floodway gates can be operated and, while upstream water levels are being increased, there is room to raise water levels without taking them above the natural level. Figures 2-7 through 2-12 show this progression. Figure 2-7 depicts the Red River where the Floodway Inlet and Floodway Inlet Control Structure are currently located and shows a natural level for a non-flood condition prior to construction of the flood protection works.

Figure 2-8 shows the same section of the river, also prior to the construction of the Floodway, but during an extreme flood event. Note, that in this condition, the natural level is higher than in Figure 2-7.

Figures 2-9 to 2-12 show the same stretch of the river with the Inlet Control Structure and Inlet in place with the same water conditions as 2-8. In Figure 2-9 the gates have not been raised and the water level is below natural as water is flowing into the Floodway Inlet.

Figure 2-10 shows how the Shellmouth Reservoir and the Portage Diversion, by reducing flows on the Assiniboine, further reduces upstream water levels.

In Figure 2-11 the gates have been raised: note how this reduces flow into the City of Winnipeg and raises water levels upstream of the gates to the natural level. At this point, while the Red River is overflowing its banks upstream of the Inlet Control Structure, the flooding is not above the natural level.

Figure 2-12 shows the Floodway gates being raised to a higher level, further reducing flows to the City of Winnipeg but increasing upstream water levels above the natural level. The level of flooding in Figure 2-12 that is above the natural level is artificial flooding. It should be noted that these figures are intended to identify the impact of the various elements of the flood protection system and vastly simplify actual Floodway operations.

The 1970 program of operation for the Floodway stated "The Red River Floodway will be operated to provide maximum protection for the Metropolitan Area of Winnipeg but, at the same time, the interests upstream of the Floodway should not be adversely affected. In order to accomplish this, the water levels upstream of the inlet Control Structure shall be maintained at the elevation which would have obtained under natural conditions." More detailed operating rules were developed in 1984. Following the 1997 flood the Red River Floodway Operation Review Committee conducted a review of the operating rules. Its recommendations were adopted in April 2000. In the fall of 2004, a new operating rule, dealing with what has been termed non-spring emergency operations was adopted.

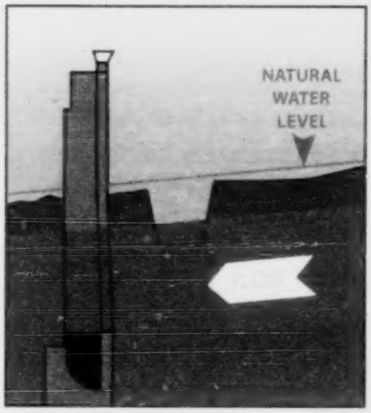

Figure 2-10: Flood, Portage Diversion and Shellmouth further reduce water level.

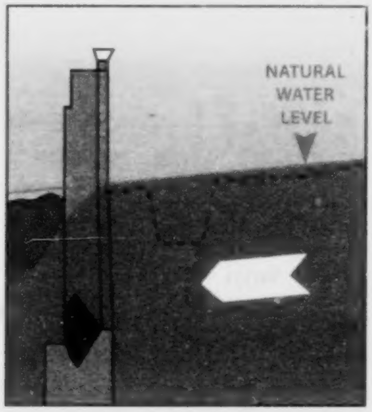

Figure 2-11: Flood, gates operated to bring water levels back to natural. No artificial flooding.

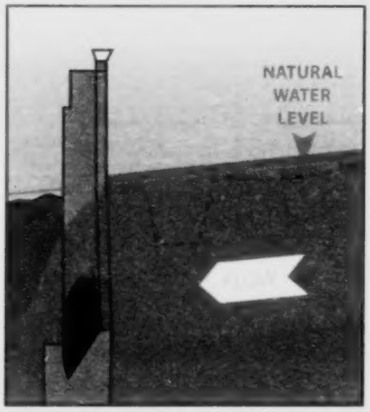

Figure 2-12: Flood, gates operated to bring water levels above natural . Artificial flooding.

upstream of the Inlet Control Structure at or below what is known as the natural level until Winnipeg is threatened with major flooding. When Winnipeg is threatened with serious flooding, the emergency rules allow for the raising of water levels upstream of the Inlet Control Structure above the natural level. These above natural water levels are referred to as artificial flooding.

The concept of natural water levels and artificial flooding are two of the most controversial issues associated with the Floodway and Chapter 6 of this report is devoted to a discussion of these issues. When used in connection with the Floodway, the term natural refers to what the water levels would be if the various flood protection measures constructed to reduce flooding in the City of Winnipeg had not been constructed. Furthermore, it excludes the impact of various developments in the City of Winnipeg, particularly bridges, which have the effect of raising the water level.

There is no one single natural level for any given point along the Red River—instead the natural level rises and falls in relation to the general flow conditions and is generally expressed as a rating curve. The rating curve that determines the natural level for the various river flows was reviewed following the 1997 flood. The reviewers concluded that there was a divergence between the 1965 rating curve that had been used to define natural and the reviewers' computation of the natural, which was based on a better understanding of hydrology plus the data that had been gathered in the in the intervening years on river flow. In 2004, the Manitoba government adopted a new rating curve based on the work of the Acres Manitoba Limited consulting firm. It should be noted that all the predictions that the Manitoba Floodway Authority (MFA) made to the Commission hearing were based on the 2004 Acres Manitoba Limited rating curve. This issue is further discussed in Chapter 6.

It might first appear that the natural level for the Floodway would simply be the water level for any given rate of flow as long as the Floodway gates are not in operation. (Recall that when the Floodway gates are operated, they create a backflow that raises upstream water levels.) This would be correct if it were not for the fact that a number of flood control structures can lower upstream water levels, even if the Floodway is not in operation. The three structures that have this impact are the Floodway Inlet itself, the Shellmouth Dam and Reservoir, and the Portage Diversion.

During periods of high flow on the Red River, water begins to naturally flow into the Floodway Channel. Because there are now two channels for water to follow, river levels upstream of the Inlet Control Structure are reduced below natural levels. The Shellmouth Dam and the Portage Diversion reduce the flow of the Assiniboine River into the Red River during floods, thereby also

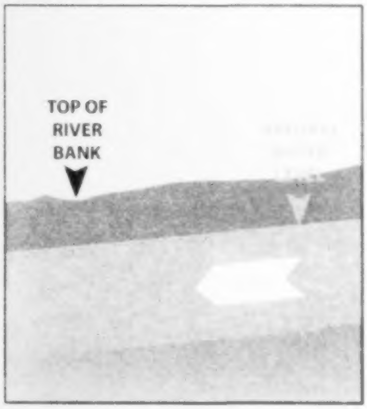

Figure 2-7: Non-flood condition.

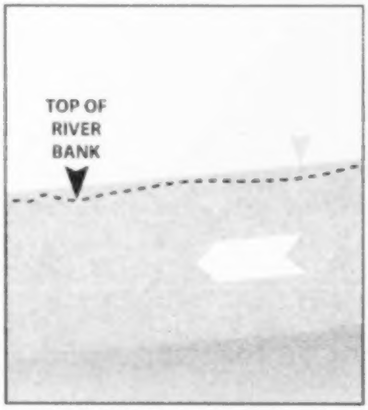

Figure 2-8: Flood, with no floodworks. Water level is at natural.

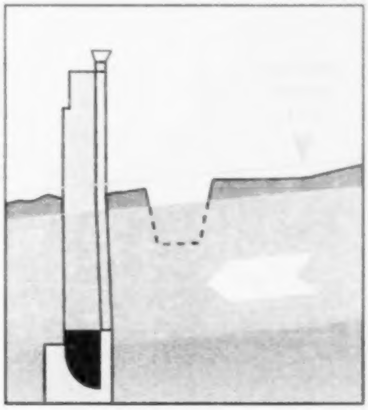

Figure 2-9: Flood, with Floodway Channel bringing water level below natural.

reducing the water levels in the Red River as far south as the Inlet Control Structure to levels that are below natural.

This means that the Floodway gates can be operated and, while upstream water levels are being increased, there is room to raise water levels without taking them above the natural level. Figures 2-7 through 2-12 show this progression. Figure 2-7 depicts the Red River where the Floodway Inlet and Floodway Inlet Control Structure are currently located and shows a natural level for a non-flood condition prior to construction of the flood protection works.

Figure 2-8 shows the same section of the river, also prior to the construction of the Floodway, but during an extreme flood event. Note, that in this condition, the natural level is higher than in Figure 2-7.

Figures 2-9 to 2-12 show the same stretch of the river with the Inlet Control Structure and Inlet in place with the same water conditions as 2-8. In Figure 2-9 the gates have not been raised and the water level is below natural as water is flowing into the Floodway Inlet.

Figure 2-10 shows how the Shellmouth Reservoir and the Portage Diversion, by reducing flows on the Assiniboine, further reduces upstream water levels.

In Figure 2-11 the gates have been raised: note how this reduces flow into the City of Winnipeg and raises water levels upstream of the gates to the natural level. At this point, while the Red River is overflowing its banks upstream of the Inlet Control Structure, the flooding is not above the natural level.

Figure 2-12 shows the Floodway gates being raised to a higher level, further reducing flows to the City of Winnipeg but increasing upstream water levels above the natural level. The level of flooding in Figure 2-12 that is above the natural level is artificial flooding. It should be noted that these figures are intended to identify the impact of the various elements of the flood protection system and vastly simplify actual Floodway operations.

The 1970 program of operation for the Floodway stated "The Red River Floodway will be operated to provide maximum protection for the Metropolitan Area of Winnipeg but, at the same time, the interests upstream of the Floodway should not be adversely affected. In order to accomplish this, the water levels upstream of the inlet Control Structure shall be maintained at the elevation which would have obtained under natural conditions." More detailed operating rules were developed in 1984. Following the 1997 flood the Red River Floodway Operation Review Committee conducted a review of the operating rules. Its recommendations were adopted in April 2000. In the fall of 2004, a new operating rule, dealing with what has been termed non-spring emergency operations was adopted.

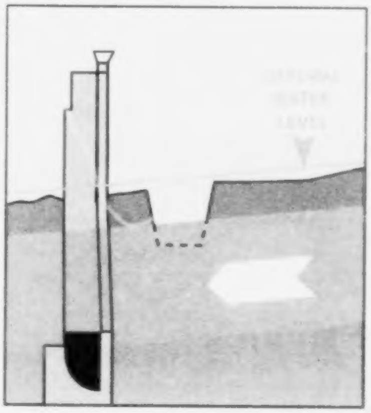

Figure 2-10: Flood, Portage Diversion and Shellmouth further reduce water level.

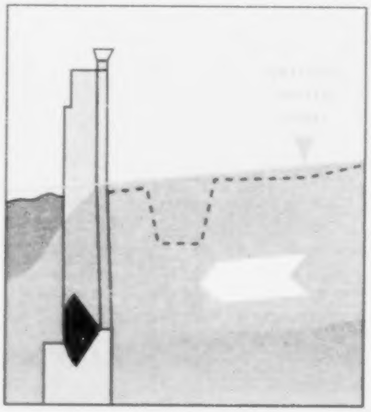

Figure 2-11: Flood, gates operated to bring water levels back to natural. No artificial flooding.

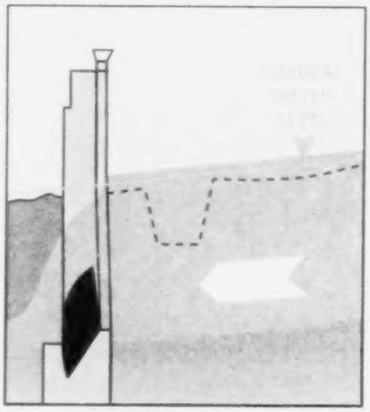

Figure 2-12: Flood, gates operated to bring water levels above natural . Artificial flooding.

2.3.1 Spring emergency rules

There are three key operating rules for spring emergency flood conditions.

Rule 1

> The Floodway should be operated so as to maintain "natural" water levels on the Red River at the entrance to the Floodway Channel, until the water surface elevation at the James Avenue gauge reaches el. 24.5 ft., or the river level anywhere along the Red River within the City of Winnipeg reaches 2 ft. below the Flood Protection Level of el. 27.8 ft.

Rule 1 seeks to maintain natural water levels upstream of the Inlet Control Structure and protect Winnipeg. The Floodway gates can be raised before the water level at the James gauge reaches 24.5 feet above James Avenue Pumping Station Datum or JAPSD (for an explanation of this term, see Key Terms) or 229.2 metres ASL as long as gate operation does not raise upstream water levels above natural. When the Floodway is operated in accordance with Rule 1, any flooding that takes place upstream of the Floodway Control Structure would be natural as opposed to artificial flooding, since the upstream water level is being maintained at or below the natural level. The Flood Protection Level referred to in Rule 1 relates to a provincial law establishing flood-protection requirements for all new developments in Winnipeg. It deals with situations where, for unexpected reasons, water levels threaten to overtop certain portions of the Winnipeg dyking system, even when the water has not topped 24.5 above JAPSD (229.2 metres ASL) at the reading taken at the James Avenue Pumping Station.

Rule 2

> Once the river levels within Winnipeg reach the limits described in Rule 1, the level in Winnipeg should be held constant while river levels south of the Control Structure continue to rise. Furthermore, if forecasts indicate that river levels south of Winnipeg will rise more than 2 ft. above natural, the City must proceed with emergency raising of the dykes and temporary protection measures on the sewer systems in accordance with the flood level forecasts within Winnipeg. The water levels in Winnipeg should be permitted to rise as construction proceeds, but not so as to encroach on the freeboard of the dykes or compromise the emergency measures undertaken for protecting the sewer systems. At the same time, the Province should consider the possibility of an emergency increase in the height of

Key terms

Natural water level

The natural water level is, in essence, the level that could be expected in the Red River for any water flow if the Winnipeg Floodway, the Portage Diversion, the Shellmouth Dam, and the associated dyking systems had not been constructed following the 1950 flood. It also excludes many bridges in flood-protected areas. Depending on how these various flood protection infrastructure are operated, they can either raise or lower the level of the Red River to elevations that are either above or below the natural level.

Artificial flooding

Artificial flooding occurs when the operation of the Floodway raises water levels above the natural level. With the current Floodway artificial flooding in spring operations commences with 1-in-90-year floods. Virtually all non-spring emergency operations result in artificial flooding.

James Avenue Pumping Station Datum

Historically, river levels within the City of Winnipeg have been expressed in relation to what is called the James Avenue Pumping Station Datum (JAPSD) with 0 feet James being the normal winter ice level at this location. 0 feet JAPSD is equivalent to 221.76 m ASL or 727.57 feet ASL. Outside the City of Winnipeg, water levels are measured in metres or feet above sea level.

the Floodway embankments and the West Dyke. At no time will the water level at the Floodway Channel's entrance be allowed to rise to a level that infringes on the allowable freeboard on the Floodway West Embankment (Winnipeg side) and the West Dyke.

This rule is for floods in which it is not possible to maintain the state of nature upstream of the Inlet Control Structure and prevent the overtopping of Winnipeg's primary dyking system. With the implementation of Rule 2, artificial flooding would take place upstream of the Inlet Control Structure. In 1997, when the Floodway was operated according to Rule 2, this artificial flooding extended as far south as Ste. Agathe and the river level at the Floodway inlet was 235.2 metres ASL.

Rule 3

For extreme floods, where the water level at the Floodway Channel's entrance reaches the maximum level that can be held by the Floodway West Embankment and the West Dyke, the river level must not be permitted to exceed that level. All additional flows must be passed through Winnipeg.

When water levels reach 237.1 metres (778.0 feet) ASL they threaten the West Dyke, the West Embankment and the Inlet Control Structure. At this point, it is impossible to avoid flooding in the City of Winnipeg. Operations are conducted to protect the Inlet Control Structure (thereby providing a mechanism to maintain as much control as possible over water levels). Under the application of this rule, flooding would take place within the City of Winnipeg along relatively predictable lines as opposed to the far more dangerous prospect of an uncontrolled overtopping of the West Dyke or West Embankment. In extreme flood events, it may also be necessary to remove a portion of the West Dyke to allow passage of flood waters. The location of such an opening would be selected so as minimize the level of flooding north of the opening. An emergency release opening would be located at a distance from most populated areas to allow time for evacuation and to avoid increasing residents' risk of being flooded above what it would be under natural conditions.

Figure 2-14 shows the effect of operating under these rules with the existing Floodway. The red dotted line running horizontally across the figure shows the current flood-protection level for residences upstream of the Floodway inlet. This line represents the impact of the flood-

Figure 2-13 Common water flows and water levels cited in this report.

	Metric	Imperial
Existing Floodway maximum flow	1,700 m^3/s	60,000 cfs
Expanded Floodway maximum flow	3,964 m^3/s	140,000 cfs
Existing Floodway maximum flood	4,800 m^3/s	169,000 cfs
Expanded Floodway maximum flood	7,700 m^3/s	272,000 cfs
1997 Flood maximum flow	4,600 m^3/s	163,000 cfs
Maximum water level at Inlet Control Structure	237.1 metres ASL	778.0 feet ASL
Trigger for Rule 1	229.2 metres ASL	24.5 feet above JAPSD
Trigger for Rule 4 (along with other considerations)	226.0 metres ASL	14 feet above JAPSD
Lowest level water to be lowered to under Rule 4	224.5 metres ASL	9 feet above JAPSD

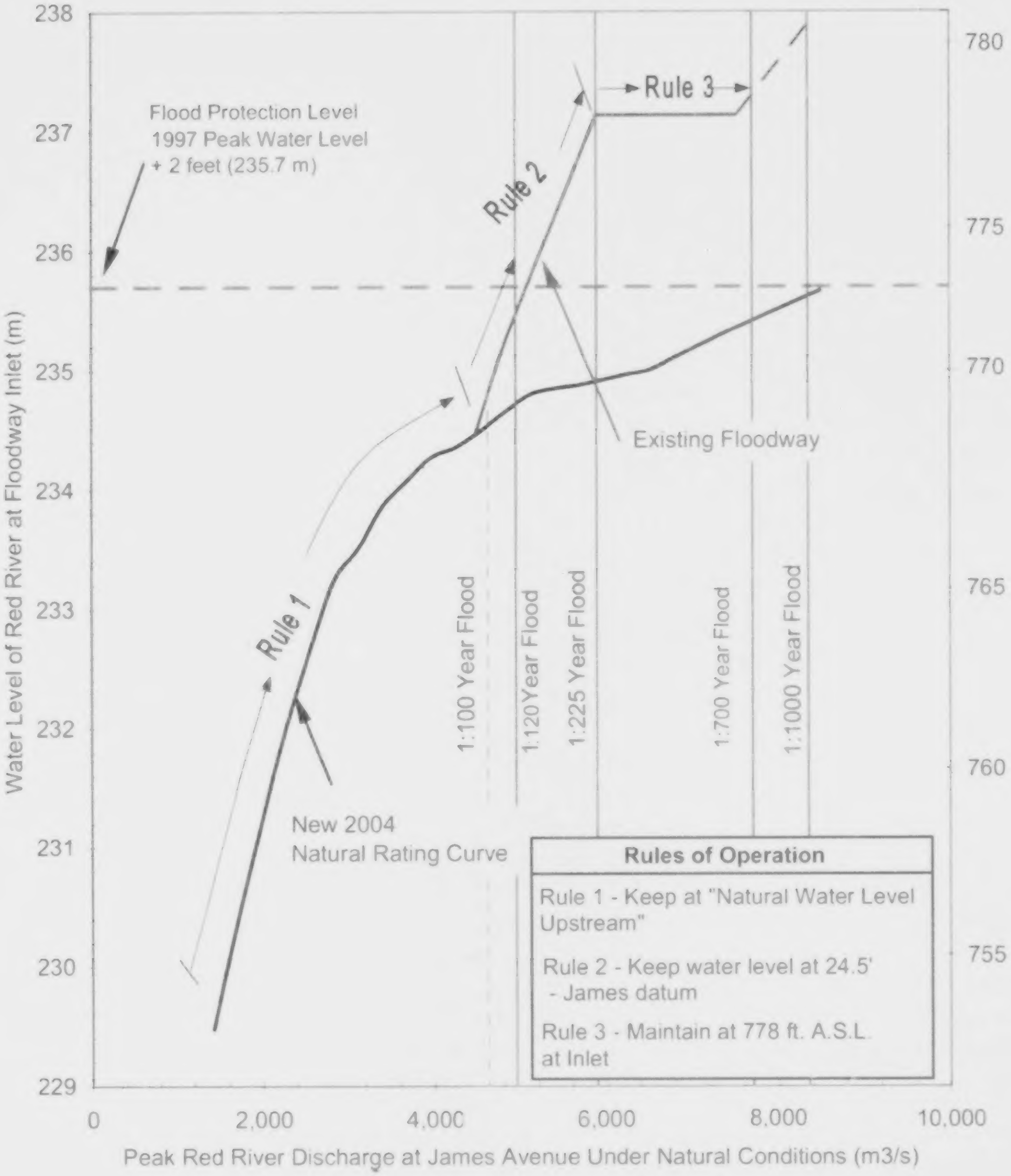

Figure 2-14: Effect of operating rules on upstream with existing Floodway.

protection work done in the Red River Valley following the 1997 flood. As a result of that work, most residents were flood-proofed to the 1997 peak water level plus an additional 0.6 metres. The black line that rises from the lower left on this figure represents the natural rating curve for various Red River flows or discharges. Note natural level only reaches the upstream flood-protection level in the case of 1-in-1,000-year flood.

When water levels within Winnipeg reach 24.5 feet above JAPSD (229.2 metres ASL), Rule 2 is invoked. This is illustrated by the green line. With the existing Floodway, Rule 2 would come into operation with a flood with a return period of approximately 1-in-90 years (approximately the same flow as the 1997 flood). It is at that point that artificial flooding would commence upstream of the Floodway. Under the operation of the current Floodway, water levels would exceed the existing flood-protection level upstream of the Floodway during a flood with a frequency of return of slightly more than 1-in-120 years. For floods of greater flow (and lower frequencies of return), the upstream water levels would continue to rise until the flow associated with a 1-in-225-year flood was reached. At that point the water level would be held constant until the flow reached the 1-in-700 year level of 237.1 metres (778.0 feet).

2.3.2 Rule 4: Non-spring emergency rules

Whereas Rules 1-3 apply to emergency spring use of the Floodway, Rule 4 applies to "non-spring emergency" use of the Floodway to protect against basement flooding, sewer backup, mould, and associated public-health risks in the City of Winnipeg. Under this rule, the Floodway gates would be raised when the Red River level reaches 14-feet above JAPSD (226.0 metres ASL) and intense rainstorms are forecast. This operation would bring the river level down by 20 centimetres a day to a target of nine feet above JAPSD (224.5 metres ASL). The MFA noted that this would leave 30 centimetres of water above the river walkways in downtown Winnipeg. Operation under Rule 4 would also raise the level in the Red River above natural upstream of the Inlet Control Structure since the Shellmouth Dam and Portage are not in operation for flood control purposes during the summer or fall.

Rule 4, which was communicated to the MFA by Manitoba Conservation in November 2004, specifies that

- There will be no operation of the Floodway as long as there is a prediction that levels will remain below 14-feet above JAPSD during the next ten days.
- If the water level is expected to rise to 14 feet above JAPSD or higher in the coming ten day period, Water Stewardship will prepare a report that describes the river level forecasts, and the risk of basement flooding in Winnipeg. That risk assessment must include the predicted peak, the length of time Water Stewardship expects the river to be at 14-feet above JAPSD or higher, and the risk of intense rainfall in the coming ten day period.
- Under this rule Water Stewardship will not operate the Control Structure to raise river levels immediately upstream of the control structure to an elevation higher than 760 feet, to achieve a river level of less than 9-feet above JAPSD, or, except in extreme urgency, to lower river levels more than one foot per day.

The final point in Rule 4 states "The Department will maintain a program of compensation for damages suffered by landowners from flooding caused by Floodway operation under this rule." The rule also requires that a news release be issued 24 hours before operation of the gates and that an attempt be made to directly notify landowners who are likely to be affected by the operation of the Floodway.

2.3.3 Other operating guidelines

Some other Floodway operating guidelines stated that:

- The Floodway gates should not be operated until ice on the river is flowing freely, unless flooding in Winnipeg is imminent.
- To minimize riverbank slumping in Winnipeg and reduce potential of sewer backup problems, final gate operations, once the level

at the entrance to the Floodway Channel recedes to elevation 229 metres ASL, shall be carried out in consultation with the City of Winnipeg.

- To alert residents that the Floodway Structure is being put into operation, the horn at the Floodway Inlet Control Structure shall only be operated once per operation, a half-hour before the first gate operation.

2.4 Operation of the existing Floodway

2.4.1 Spring emergency operations

The Floodway has operated 23 times in response to spring flood events. On nine occasions, the spring emergency operation of the Floodway has caused water levels upstream to rise above the natural level. The 1997 flood event was the only time that the Floodway operators consciously made a decision to operate on the basis of Rule 2. During the 1997 flood, Manitoba and City of Winnipeg officials concluded that the trigger point for moving to Rule 2 had to be adjusted downwards from 25.5-feet above JAPSD to 24.5-feet above JAPSD (from 229.5 metres ASL to 229.2 metres ASL) to avoid overtopping of Winnipeg's primary dykes. In 1974 and 1976, the water was inadvertently raised above natural as the result of an error in the gate relationship that was used to compute flows. In the other six cases, while the water levels were raised above the recomputed natural in the spring operation, the level did not rise above the 1965 computation of natural, which was the level that the operators were trying to maintain.

2.4.2 Non-spring emergency operations

Non-spring emergency operations have been carried out twice—in 2002 and 2004. Both of these operations were carried out prior to the promulgation of Rule 4. Both operations led to artificial flooding of low-lying land upstream of the Floodway. Manitoba Water Stewardship informed the Commission that the conditions for considering the invocation of Rule 4 would have occurred in 16 of the last 36 years.

2.5 City of Winnipeg flood protection infrastructure

Winnipeg's 110 kilometres of primary dykes were constructed following the 1950 flood and run, usually along road surfaces, parallel to portions of the Red, Assiniboine, and Seine rivers in Winnipeg. The minimum elevation for the primary dykes was 26.5 feet-above JAPSD or 229.9 metres ASL. Given a 0.6 metre free board, this provides protection against floodwater that are 229.2 metres ASL. During the 1997 flood, it became apparent that there were portions of the primary dykes that were not at an elevation of 26.5 feet JAPSD (229.9 metres ASL). Additional pumps were installed to lift runoff into the rivers and outside the dykes in low-lying areas. A series of borrow sites were also established so material could be readily accessed to raise dykes in the event of future flooding emergencies. The adequacy of the City of Winnipeg flood-protection infrastructure will be discussed in Chapter 11.

Other elements of the City's flood protection system are the sewage treatment plant main pumps that can be used to reduce the incidence of basement flooding, stormwater retention basins that store runoff, thus reducing peak storm sewer flows, under-utilized pipes in the sewer system that can be used to store water, the Seine River Diversion, and the St. Andrews Lock and Dam.

The secondary dykes protect properties on the river side of the primary dyking system. Most of these dykes are temporary, but a number of permanent secondary dykes have been constructed since 1999 under a federal-provincial program.

2.6 Conclusion

These infrastructure and operating rules form the basis of the flood protection system for the City of Winnipeg, although as noted they also provide flood protection to communities along the Assiniboine River and north of the City of Winnipeg along the Red River.

Chapter 3

The proposed expansion of the Red River Floodway

This chapter reviews:

- The need for further improvements for flood protection for Winnipeg.
- The general design criteria of Floodway expansion.
- The major elements of Floodway expansion.
- Impact of operation of an expanded Floodway on flood-protection levels.
- Flood-related compensation provisions.

3.1 The need for further improved flood protection for Winnipeg

The flood-protection system described in Chapter 2 was intended to provide Winnipeg with protection from floods with natural flows on the Red River downstream of the Assiniboine River up to 4,800 cubic metres per second (m^3/s). By comparison, the 1997 flood had an estimated flood peak of 4,600 m^3/s. At the time of the design of these works, the Floodway was calculated to provide protection against a flood with a return period of 160 years. Once recent flow records are considered, the return period for the 1997 flood is closer to 90 to 100 years.

The extensive use of the Floodway since its completion has underlined its value as a flood-protection system. However, the occurrence of significant floods in recent years, particularly the 1997 flood, which is surpassed only by the 1826 flood, has also brought to the forefront the need to increase the level of flood protection in the Red River Valley. Manitoba's flood-protection system, which cost a total of $94-million to construct, has saved the province from damages of more than $8-billion, not including business losses. During the 1997 flood, 5 kilometres of primary dyke within the City of Winnipeg were raised and 800 homes between the primary dykes and the river required sandbagging. Temporary sewer-related works were required to protect public health and prevent basement flooding. A 1999 study indicated that, with the existing Floodway, a 1-in-290-year flood would inflict $5.77-billion worth of damage to Winnipeg, while a 1-in-500-year flood would create $10.46-billion in damages.

Following the 1997 flood, a $110-million federal-provincial initiative (the Red River Valley Flood Proofing and Dike Enhancement Agreement) increased flood protection in Red River Valley communities. This program extended protection to 1997 levels plus 0.6 metres to 14 ring-dyked communities and 1,700 homes and businesses. Residents and businesses outside the ring dykes that received flood proofing were required to contribute 25 per cent of the cost (up to $10,000) on expenditures under $70,000 and 100 per cent of the cost over $70,000. The rural municipalities were required to contribute 10 per cent of the cost of the flood-proofing costs.

The International Joint Commission[1] (IJC) established the International Red River Basin Task Force to examine a range of alternatives to prevent future flood damage. After studying a wide range of alternatives, a KGS Group report to the IJC concluded that the preferred options for providing a major increase in flood protection for Winnipeg were either the construction of a Ste. Agathe Detention Structure or expansion of the Red River Floodway. The Ste. Agathe Detention Structure would have included an earthen dyke across the Red River Valley, control structures adjacent to the Red, Marsh, and Rat rivers, a discharge channel from the Marsh River control structure, a diversion channel to the Rat River, upgrades to existing flood-protection infrastructure and improvements to the Floodway Inlet Control Structure. It would have provided flood protection up to a 1-in-1,000-year flood at a cost of $500-million, including upgrades to flood-protection infrastructure in Winnipeg.

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[1] The International Joint Commission, composed of Canadian and United States appointees, oversees issues related to waters on the boundary between the United States and Canada. It was established by the 1909 International Boundary Waters treaty.

The IJC also studied the option of developing reservoir capacity in the Red River watershed through micro-storage techniques, but concluded that these options would not be effective in the case of large floods. (Micro-storage involves the temporary storage of springtime runoff in existing depressions within the river basin until major flood crests pass.) A subsequent study of both the Ste. Agathe Detention Structure and Red River Floodway expansion options noted that the Ste. Agathe Detention Structure would require an international agreement with the United States and an agreement with Roseau River First Nation. Such negotiations would be lengthy and might not result in success. Following a series of public consultations, including four public meetings held by the Clean Environment Commission in 2002, an all-party committee of the Manitoba legislature chose to pursue Floodway expansion. In December 2003, Manitoba and Canada signed a $240-million Canada-Manitoba Cost-Sharing Agreement to begin work on the Floodway Expansion Project.

3.2 General design criteria

The proposed Floodway expansion is designed for the passage of a flood that would be equaled or exceeded once every 700 years. A 1-in-700-year flood is larger than any recorded flood and was selected as the Design Flood for the expansion on the basis of cost-benefit analysis. It is proposed that the expanded Floodway must handle this 1-in-700-year flood with a flow of 3,960 m^3/s at a maximum water level of 237.1 metres above sea level (ASL) at the Floodway entrance while operating in accordance with the current Floodway operating rules.

The proposed Floodway expansion would meet these objectives by widening the Floodway Channel and improving the flow capacity past the various bridges.

The components of the Floodway Expansion Project are as follows:

- Channel excavation.
- Restoration/armouring of the Low Flow Channel.
- Expansion of the opening in the East Embankment on the east side of the Grande Pointe drop structure.
- Improvement in protection and reliability of the Floodway Inlet Control Structure.
- Enlargement and improvement of the Outlet Structure.
- Replacement of seven bridges.
- Rehabilitation of six bridges.
- Modification of two City of Winnipeg water supply aqueducts and the Deacon Drain Line.
- Modification of the Seine River Syphon and Overflow Structures.
- Replacement/rehabilitation of drainage structures that discharge local runoff into the Floodway.
- Replacement and modification of utility lines.
- Increase in the height and length of the West Dyke.

The Preliminary Engineering Report for the Floodway assumed that the City of Winnipeg would either upgrade its primary dykes to permit the safe passage of 2,270 m/^{3}s (the flow that would be required to pass through the City during a major flood) or ensure that temporary dykes could be erected in time to permit the passage of this flow.

The following sections provide greater detail on the proposed elements of Floodway expansion.

3.3 Channel excavation

The Floodway Channel would be expanded to accommodate a design flow of 3,960 m^3/s at a maximum level of 237.1 metres ASL. To accomplish this, the existing Floodway Channel would be widened by as much as 60 metres at locations to provide the most cost-efficient increase in flow capacity. Widening has been chosen over deepening, in order to reduce the potential threat of groundwater contamination and increased groundwater loss along portions of the Channel. The widening would require the excavation of 25-million cubic metres of material. The first 5 kilometres of the Floodway Channel would not be widened, as most of the floodwaters in large floods would now enter the Floodway overland through gaps in the East Embankment specifically designed for that purpose.

Channel side slopes would generally be designed with a slope of 1:6, (that is 1 unit of measure vertical to 6 measures horizontal) with appropriate measures taken with the placement of the surplus soil disposal embankments to ensure bank stability. The Channel would be designed with flow velocities to prevent the deposition of sediment along the Channel. The Low Flow Channel, which has eroded over the years, would be returned to its original design and armoured against further erosion.

3.3.1 Channel configuration

The expanded Channel base would be excavated symmetrically about the existing Channel centerline with four main exceptions. At the Branch 1 Aqueduct, the excavation would be shifted to the east slope. At the Kildare and Cooks Creek drainage structures, the Channel would be shifted to the west. In the Springhill area, the Channel would be aligned to minimize the impacts to the numerous facilities in the area, including overhead utilities, municipal wells, and the ski hill. As a result, the Channel would be shifted slightly to the east near the transmission line and to the west near the ski hill.

A 200-300-metre long clay plug or barrier would likely be required along the east edge of the newly excavated Channel in the vicinity of the Springhill Ski Hill to ensure that the Floodway has no additional impact on the unconfined Birds Hill aquifer.

Downstream from the Provincial Trunk Highway 44 Bridge, the Channel expansion would be shifted towards the east. This avoids the need for any excavation that could affect sites of archaeological interest along the west side of the Floodway near the Outlet.

Bridges along the Floodway would be raised and lengthened to accommodate the increased water flow. The low level crossing at Dunning Road would be closed for a brief period to allow excavation of the Channel at that point.

3.3.2 Erosion control in the expanded Floodway Channel

Erosion control in the Channel relies on the maintenance of vegetation coverage of the Channel and side slopes and careful control of flow velocities. Different bed materials and vegetative species would offer different abilities to withstand stresses along the lining of the expanded Floodway Channel. Under the Floodway revegetation plan, approximately 21-million square metres of exposed clay and glacial till subsoils must be vegetated.

3.3.3 Construction of expanded Floodway Channel

Channel expansion is tentatively planned to be carried out over four years with 20 per cent of the required excavation carried out in year 1, 30 per cent in each of years 2 and 3, and the final 20 per cent in year 4. Given that there would be 42 kilometres of excavation required over 28 months, approximately 1,500 metres would have to be excavated every month. It is planned to have a number of contractors each opening a 500-metre section for excavation every month. In this way, manageable units of the Channel can be opened at one time and then seeded without prolonging exposure of excavated slopes.

The preferred construction sequencing begins at the upstream end and proceeds downstream to the outlets. This construction period can be reduced to three or perhaps even two years if considered desirable.

3.4 Expansion of the opening in the East Embankment on the east side of the Grande Pointe drop structure

There currently is a small gap in the East Embankment where the Grande Pointe drainage drop structure is located. It is proposed that this gap be enlarged to a length of approximately 400 metres. This gap would serve as a fourth entry point to the Floodway during an emergency flood event.

3.5 Improvement in protection and reliability of the Floodway Inlet Control Structure

Work on the Inlet Control Structure includes:

- Measures to improve reliability of the Inlet Control Structure gates.
- Improvements to existing components of the gate operating system.
- Improvements to the erosion control measures on the embankments immediately adjacent to the Inlet Control Structure.

3.5.1 Dam Safety Review

When the Floodway gates are raised, they function as a dam, halting a portion of the flow of the Red River into City of Winnipeg. As a result, they are subject to the same sorts of stresses as other dams. A failure of the gates to rise properly or to remain vertical once they have been raised could have very serious consequences, resulting in rapid flooding of the City of Winnipeg or high water levels upstream of the gates. Consultants to the Manitoba Floodway Authority (MFA) carried out a Dam Safety Investigation, based primarily on the Canadian Dam Association, Dam Safety Guidelines. A review, from a dam safety perspective, of the West Dyke design was also undertaken. At the hearing, the MFA stated that the Inlet Control Structure had been judged to be sound and had the integrity to withstand a water level of 237.1-metres (778.0 feet) ASL.

Consultants to the MFA failed to reach an agreement as to the need for some form of gate redundancy (in engineering, a redundant component is a component that is included in the case of failure of another component). Therefore, a panel of Dam Safety experts was convened to review the safe operation of the control structure. This report is discussed in Chapter 9.

3.6 Floodway Outlet upgrades

The Floodway Outlet Structure will require considerable modification in order to accommodate the increased discharge of the expanded Floodway. It is proposed that it be expanded to the north by 50 metres, essentially doubling the width of the structure.

It is proposed that the width of the stilling basin be increased by 33.4 metres to a total width of 90 metres. Energy absorbing appurtenances such as chute blocks would be placed at the base of the crest down into the stilling basin, and the floor of the stilling basin would have baffle blocks leading to an end seal, which would also have blocks. The blocks and the stilling basin would dissipate the energy of the water flowing over the outlet lip before it reaches the river, resulting in substantially more energy dissipation than the existing structure. On the west bank of the Red River, immediately north of the Outlet, it is proposed that the existing riprap be repaired, and the erosion protection be extended 1,200-metres downstream of the Outlet. (Riprap is a layer of large stones, broken rock, boulders, or other suitable material used as a protection against erosion.) The crest of the outlet structure would be raised 2 metres above the level of the existing structure. Low-level water passages would release low flows and minimize ponding of water upstream of the structure.

3.7 Replacement of seven bridges

The following bridges require replacement:

- St. Mary's Road.

- Provincial Trunk Highway 59 South – Southbound Structure.
- Trans-Canada Highway No. 1 East.
- Provincial Trunk Highway 15.
- Provincial Trunk Highway 59 North.
- Provincial Trunk Highway 44.
- CPR Emerson Rail Bridge.

This work would include the twinning of Provincial Trunk Highway 15. The Manitoba government owns these bridges, since they were installed as a part of the original Floodway, and the MFA is paying for their replacement.

3.8 Rehabilitation of six bridges

The following six bridges require rehabilitation:

- Provincial Trunk Highway 59 South – Northbound Structure.
- CNR Sprague Rail Bridge.
- Greater Winnipeg Water District Railway Rail Bridge.
- CNR Redditt Rail Bridge.
- CPR Keewatin Rail Bridge.
- Central Manitoba Railway (CEMR) Pine Falls Rail Bridge.

As is the case with the bridges that are being replaced, the Manitoba government owns these bridges and the MFA is paying for their rehabilitation.

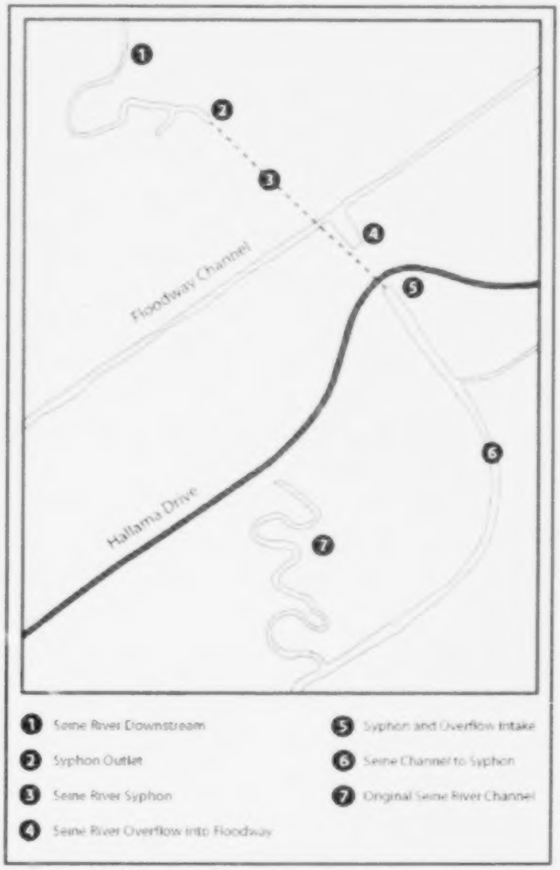
3.9 Modification of two City of Winnipeg water supply aqueducts and the Deacon Drain Line

Two aqueducts conveying all of the City of Winnipeg's drinking water would require reconstruction to accommodate the expanded Floodway Channel. The Branch I aqueduct connects the Main Aqueduct and the Deacon Reservoir to the McPhillips and McLean Distribution System Reservoirs. Branch II connects the Main Aqueduct and Deacon Reservoir to the McLean and Wilkes Avenue reservoirs. The Deacon Drain Chamber outfall line and the two Aqueduct underdrain outfalls would accommodate the Floodway expansion.

3.10 Seine River Syphon and overflow structures

The current Seine River Inverted Syphon and overflow structure is located under the most southerly reach of the Floodway. (Figure 3-1) It consists of the following components:

- An inverted syphon that carries Seine River flow under the Floodway.
- Four overflow outlet pipes that release excess water into the Floodway during Seine River high-flood conditions.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Floodway Channel
Hallama Drive
❶ Seine River Downstream
❷ Syphon Outlet
❸ Seine River Syphon
❹ Seine River Overflow into Floodway
❺ Syphon and Overflow Intake
❻ Seine Channel to Syphon
❼ Original Seine River Channel

Figure 3-1: Seine River syphon.

- A reinforced concrete intake structure located south of Hallama Drive and the Floodway East Embankment. This serves as the intake for both the syphon and the overflow outlet.

The syphon consists of a vertical drop structure that connects to a 1.5-metre diameter corrugated metal pipe. After carrying the flow under the Floodway, the pipe releases it through a concrete outlet structure into the Seine River on the northwest side of the Floodway. The pipe has a capacity of approximately 4 m^3/s under normal conditions and 10 m^3/s under extreme flood conditions. In 1999, a 1.2-metre diameter smooth-plastic pipe was installed inside the original metal pipe. Although the plastic lining has a narrower diameter than the original pipe, its smooth surface allows it to convey the same flow.

The overflow portion of the intake consists of a basin that dissipates the energy of the water flow and connects to four 2.4-metre diameter corrugated metal pipes. The 90-metre long pipes extend under the East Embankment and release water into the Low Flow Channel. Under extreme conditions, it is estimated that a flow of 42 m^3/s could enter the Floodway through these pipes.

The MFA has proposed that the syphon and the overflow remain in place. A gated-backflow control structure would be constructed in the East Embankment to prevent water from the Floodway from flowing back up the overflow pipes into Grande Pointe. The overflow pipes that are no longer required would be cut and permanently blocked with concrete. A new parabolic trashrack system (a trashrack is a rack that stops debris from entering the syphon) would be built upstream of the syphon and overflow inlets. This would address the current problem created by debris blocking the syphon inlet.

3.11 Replacement/Rehabilitation of drainage structures that discharge local runoff into the Floodway

Widening the Floodway Channel would require modification or replacement of local drainage inlets on both sides of the Floodway that convey discharge from local land drains into the Floodway. The preliminary designs are for replacement of the existing rural drain drop structures with structures designed to accommodate the 1-in-100-year flow event and a service life in excess of 50 years. (The local drainage channels are at prairie level when they intersect the Floodway Channel and therefore require drop structures to allow discharge into the Channel without eroding the Channel bottom.) Drainage inlet structures requiring modification or replacement include:

- Centreline Drain – replacement.
- North Bibeau Drain – replacement.
- Cooks Creek Diversion – repair.
- Springfield Road Drain – replacement.
- Shkolny Drain – replacement.
- Ashfield Drain – replacement.
- Transcona Storm Sewer Outlet – repair.

Channel improvements would be made within the right-of-way to accommodate increased design flows. For agricultural drop structures, transition structures would be built lower and drain channel depth increased within the right-of-way to accommodate future growth in local drainage systems.

3.11.1 Rural drop structures

The invert (the bottom) of rural drainage drop structures would be built lower and drain channel depth would be increased within the right-of-way to accommodate future upgrading in local drainage systems. For all drainage drop structures and channels along the Floodway and within the right-of-way, the capacity would be maintained or increased.

3.11.2 Urban drainage

There are two urban drainage outlets along the length of the Floodway Channel. The Transcona storm sewer outlet (also known as the Kildare outfall) drains an area of 1,980 hectares servicing about 30,000 people. The outfall and associated gate chamber require considerable modification as a result of Channel widening and the increased design water level in the Floodway.

This would necessitate modification to the outfall and installation of a new gate chamber. (A gate chamber is a gated-structure used to prevent floodwater in the Floodway from flowing back into the storm sewer.)

The other urban outlet is the Country Villa Estates outlet structure, which drains an urban subdivision in the Birds Hill area. This is a relatively new structure and the only modifications consist of those required to fit the structure to the new Floodway configuration.

3.12 Replacement and modification of utility lines

A number of utilities cross the Floodway Channel above and below the ground surface, and via utility conduits contained in bridge crossings. In addition, several utility lines pass through existing Red River Floodway rights-of-way parallel to the existing Channel. The following section describes which of these lines would have to be either replaced or modified.

3.12.1 Manitoba Hydro electrical transmission line crossings

Replacement, modification, and design changes are required for the fourteen existing and future Manitoba Hydro transmission lines that cross or are expected to cross the expanded Floodway and the six existing and future transmission lines that run parallel to the Floodway.

3.12.2 Manitoba Hydro Natural Gas

Several Manitoba Hydro natural gas lines cross or are adjacent to the Floodway. New lines would be installed across the width of the expanded Floodway Channel excavation. Lines running parallel to the Floodway would be relocated outside of the Channel excavation area. The old lines would be abandoned in place and removed, if necessary, during Channel excavation.

3.12.3 Manitoba Telecom Services

A total of 12 Manitoba Telecom Services cable crossings may be affected by the Floodway expansion. Five are on bridges, five are buried, and two run parallel to the Floodway Channel.

3.12.4 Manitoba Hydro telecommunications

There are three Manitoba Hydro communication cable crossings and two communication lines parallel to the Floodway. Two of the lines that cross the Floodway would have to be replaced.

3.12.5 Municipal utilities

Two Rural Municipality of East St. Paul water distribution lines that the cross the Floodway would require replacement during the third year of construction.

3.12.6 Oil pipelines

Two Imperial Oil pipelines crossing the Red River Floodway would need to be replaced.

3.13 West dyke enhancements

The West Dyke extends approximately 45 kilometres west from the Floodway Inlet Control Structure. Its current elevation is estimated to protect against water levels of approximately 237.1 metres (778.0 feet) ASL. The Project would raise the height of the existing dyke by up to 2.7 metres to create more freeboard (1.7 metres) and extend the western limit of the West Dyke approximately 18 kilometres beyond its current location by raising existing municipal roads. The purpose of raising the dyke is not to provide protection against a higher water level than 237.1 metres (778.0 feet) ASL but to provide increased freeboard protection against wind and wave action. Figure 3-2 shows the current West Dyke and the proposed expansion.

Portions of the West Dyke that would experience significant wave heights would be armoured with riprap. The remaining dyke would be armoured with vegetative soil reinforcement. The crest width for all sections of the dyke would be set at 7.3-metres. A layer of road topping material would be placed on the crest of the dyke. All municipal access roads and ramps onto the West Dyke would be widened and regraded to match the new dyke elevations. It is estimated that approximately 20 kilometres of ditch grading is required in the drainage system parallel to the West Dyke. It is expected that approximately 160 hectares of land may be required along the existing West Dyke right-of-way to accommodate these modification.

The pre-design for the West Dyke assumes no changes to the concrete Domain Drainage Control Structure and the Manness Drainage Control Structure. Culverts adjacent to the drainage control structures may require relocation. Other through-dyke culverts can simply be extended as required.

The construction sequence for the West Dyke is proposed to take two years with a construction season between the months of May and November. The work would have to be scheduled in such a manner as to allow access to all residential and business properties with minimal disruption.

3.14 Construction schedule

The proposed three-phase construction schedule assumes the obtaining of regulatory approval by mid-July, 2005. Phase 1 covers the project definition and environmental-assessment phase of the project, starting with the pre-design studies in February 2003, and concludes with the receipt of regulatory approvals. Phase 2 covers the final design, tendering and awarding of contracts, and all necessary preparations for construction, including surveys, land acquisition, and the establishment of environmental monitoring programs. Phase 3 covers all of the construction activities for the project, as well as construction management and contract administration.

The proposed four-and-half-year construction schedule does not reflect any constraints on the availability of funding. Each year of construction would achieve an incremental increase in the capacity of the Floodway to handle larger floods.

In its supplementary filing, the MFA presented a framework for the preparation of a Construction Phase Environmental Protection Plan (CPEP) and a framework for the preparation of Monitoring and Follow-up Plans. These plans would be submitted to the Environmental Assessment and Licensing Branch of Manitoba Conservation for approval prior to construction. Changes to the plans would have to be approved in advance by Manitoba Conservation. The MFA committed itself to providing the Environmental

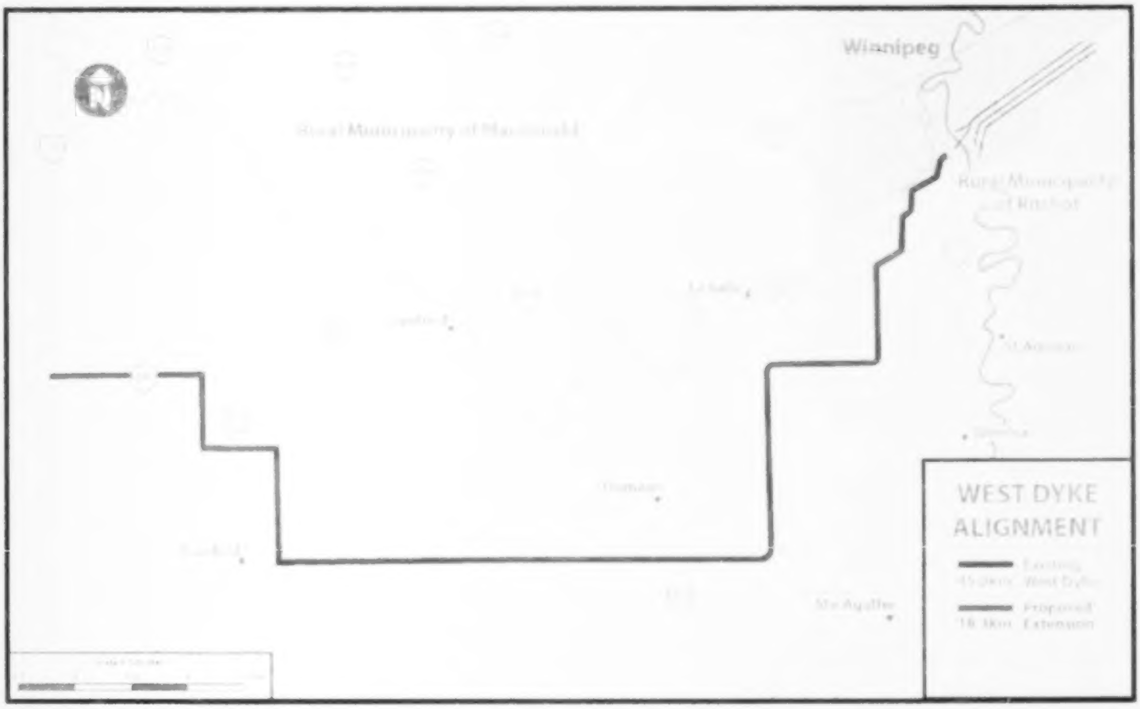


Figure 3-2: Proposed West Dyke extension

Assessment and Licensing Branch with a conceptual level plan for review during the environment assessment phase of the Project.

The proposed Construction Phase Environmental Protection Plan would address all aspects of construction, including the Floodway Channel, Channel Outlet, West Dyke, and bridges, as well as upgrades to the Inlet Control Structure and relocation of utility crossings and ancillary works. The Plan would not address ongoing or environmental impact data collection or monitoring that may be required by any licence under *The Environment Act*. The MFA is proposing that there be two CPEPs, one for bridge and transportation construction and one for the Floodway Channel, Outlet and Inlet Structures, and the West Dyke. The plans and accompanying support documentation would provide a complete description of each project activity. The plans would also describe potential environmental impacts, provide measures to control pollution and environmental degradation, and plan and provide measures required to correct conditions that develop during the construction phase.

3.15 Matters the MFA declared to be out of scope

In its opening presentation to the Commission panel, the MFA described the following issues as being out of the scope of the project under assessment. The Commission notes that the EIS Guidelines, not the MFA, determine what is inside and outside the scope of the hearing.

3.15.1 Summer non-emergency operations

Such operations would take water levels below the level of the walkways on the Red and Assiniboine rivers in downtown Winnipeg. The MFA said any decision to undertake this activity awaited the completion of studies on such issues as impact on riverbanks, fish passage, and wildlife. Should a decision be taken to operate the Floodway to control water levels below the walkway levels, the MFA said it would be necessary to seek future regulatory approvals.

3.15.2 Recreation opportunities

The MFA did not present any recreation proposals to the hearing. Instead it stated that, while it was consulting with a number of organizations on recreation and economic opportunities related to the Floodway were out of scope. The MFA position was that it would not support any proposal that had the potential to have a significant adverse effect on the environment or jeopardize the flood-protection role of the Floodway. The MFA also took the position that other parties would have to fund recreation or economic initiatives and would have to assume responsibility for acquiring all needed permits and licences.

3.15.3 City of Winnipeg flood-protection infrastructure

While there is a need to raise portions of the City of Winnipeg primary dyking system to ensure the safe passage of the flow that would be required to pass through the City during a major flood, the MFA declared this issue to be out of scope. Currently, the City is proposing to spend $5-million a year on flood infrastructure. In its presentation, the MFA stated it could take over 20 years to make all the required improvements.

3.15.4 Ice jams

The MFA took the position that current and expanded Floodway operations have and would have no impact on ice jams downstream of the Floodway Outlet Structure. The MFA also noted that there was a municipal/provincial *ad hoc* working group addressing this issue.

3.15.5 Dredging of the Red River

While the federal government has dredged the Red River downstream of the Outlet Structure in four separate locations, this program is currently discontinued. The MFA submitted that there would be no significant effect on flood levels if dredging were not reinstated, nor would there be any discernable long-term difference in sediment transport in the river due to Floodway expansion.

3.16 Impact of operation of expanded Floodway on flood-protection levels

The operation of an expanded Floodway has different implications for flood protection depending on the size of the flood and the location that is being considered: upstream of the Floodway Inlet, downstream of the Floodway Outlet, and the City of Winnipeg.

3.16.1 Upstream of the Floodway Inlet

Figure 3-3 repeats the same information found in Figure 2-14 in Chapter 2, but adds a blue line to demonstrate the effect of Floodway expansion on water levels upstream of the Floodway. The blue line shows that with Floodway expansion it would not be necessary to invoke Rule 2 until flows reached a level associated with a 1-in-120-year flood. Flows would have to reach levels associated with 1-in-200-year flood before they surpass the upstream flood-protection level. The upstream water levels would not reach 237.1 metres (778.0 feet) until flows reached the levels associated with a 1-in-700-year flood. In terms of its impact on flood-protection levels upstream of the Inlet Control Structure, the expanded Floodway does not eliminate artificial flooding but it does reduce the likelihood of its occurrence and reduces the level of artificial flooding for all floods below the 1-in-700-year level.

Figures 3-4 to 3-6 show the effect of Floodway expansion on the extent of artificial flooding for three scenarios: the 1-in-120-year flood, the 1-in-225-year flood, and the 1-in-700-year flood. The red line indicates upstream water levels with Floodway expansion, the blue line indicates the water levels with the existing Floodway. The black dashes above the names of communities indicate the level of protection provided by their ring dykes. In Figures 3-4 and 3-5, the difference between the red line (the expanded Floodway) and the blue line (the existing Floodway) demonstrate the degree to which the Floodway reduces the frequency and severity of artificial flooding. Figure 3-6, which illustrates the 1-in-700-year flood indicates that the level of upstream artificial flooding would be no higher than it is with the existing Floodway.

3.16.2 City of Winnipeg

Figure 3-3 also demonstrates the significant benefits that accrue to the City of Winnipeg from expansion. It shows that water levels would not reach 24.5 feet above JAPSD (229.2 metres ASL) until the 1-in-120-year flood, as opposed to the current 1-in-90-year level. More significantly, it shows that the system would not reach its maximum capacity (which is associated with the triggering of Rule 3) until the 1-in-700-year flood. Currently it reaches that capacity with a 1-in-225-year flood.

3.16.3 Downstream of the Outlet

Figure 3.7 compares Red River flows downstream of the outlet for both the expanded and existing Floodway for three different floods—1997 flood, the 1-in-225-year flood, and the 1-in-700-year flood. The figure shows that, for 1997 flood flows, an expanded Floodway would raise downstream water levels by a maximum of 2 centimetres. For the 1-in-225-year flood, the impact of expansion would be a downstream increase of 10 centimetres. For the 1-in-700-year flood, the increase due to Floodway expansion would be a maximum of 30 centimetres. Because of the impact of the Shellmouth Dam and the Portage Diversion, the increased water levels, even in the 1-in-700-year flood, do not surpass the natural levels for flows up to the 1-in-700-year flood.

3.17 Flood-related compensation provisions

Three new forms of compensation for flood and Floodway damages have been proposed or adopted in relation to the operation of the Red River Floodway. These are:

- *The Red River Floodway Act.*
- The MFA's proposed compensation for flooding north of the Floodway outlet.
- Compensation related to non-spring emergency operation of the Floodway.

In addition to these measures related to flood-damage compensation, the MFA has also established an $11-million fund to be used to mitigate other Floodway-related impacts,

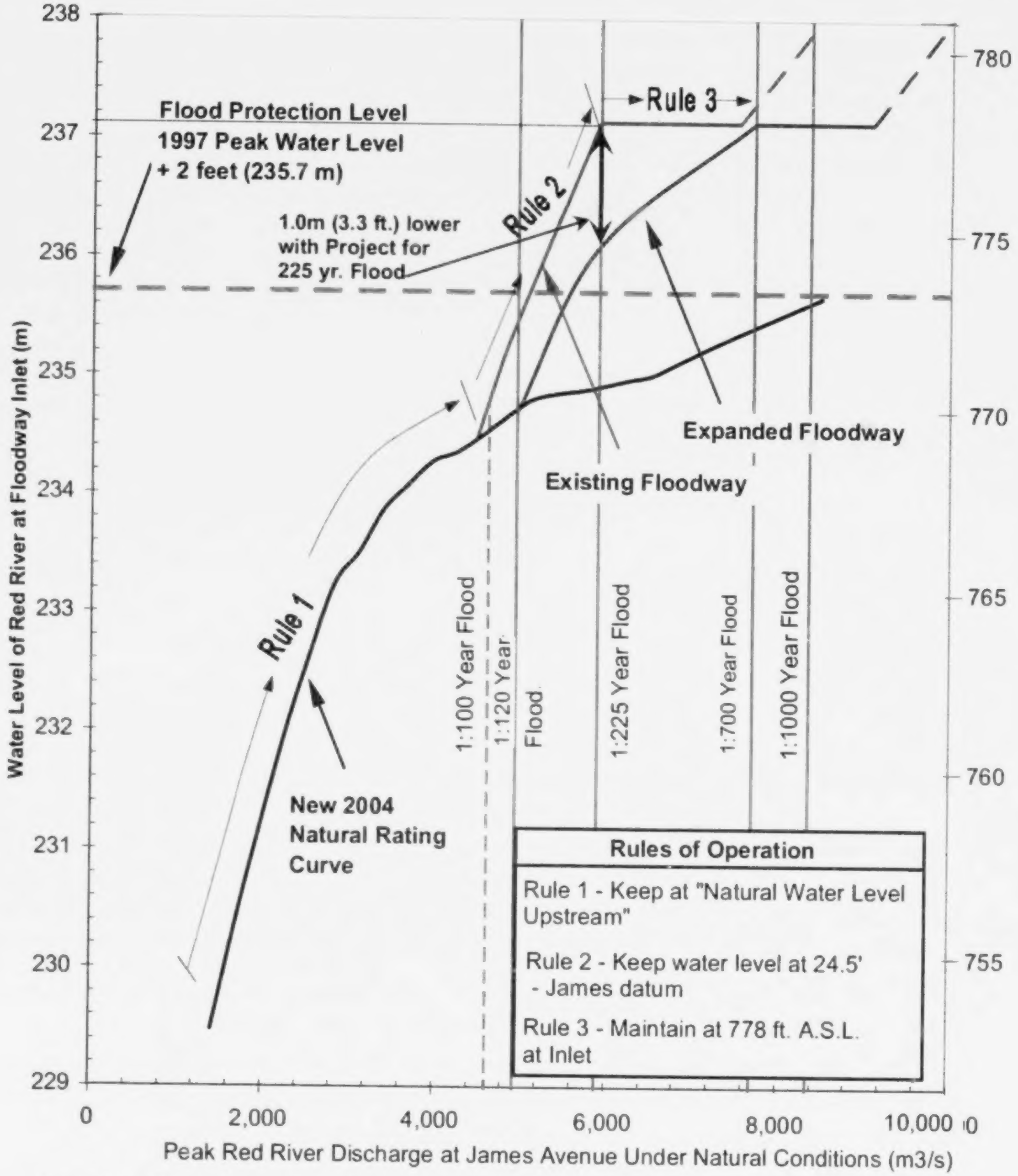


Figure 3-3: Effect of operating rules on upstream with expanded Floodway.

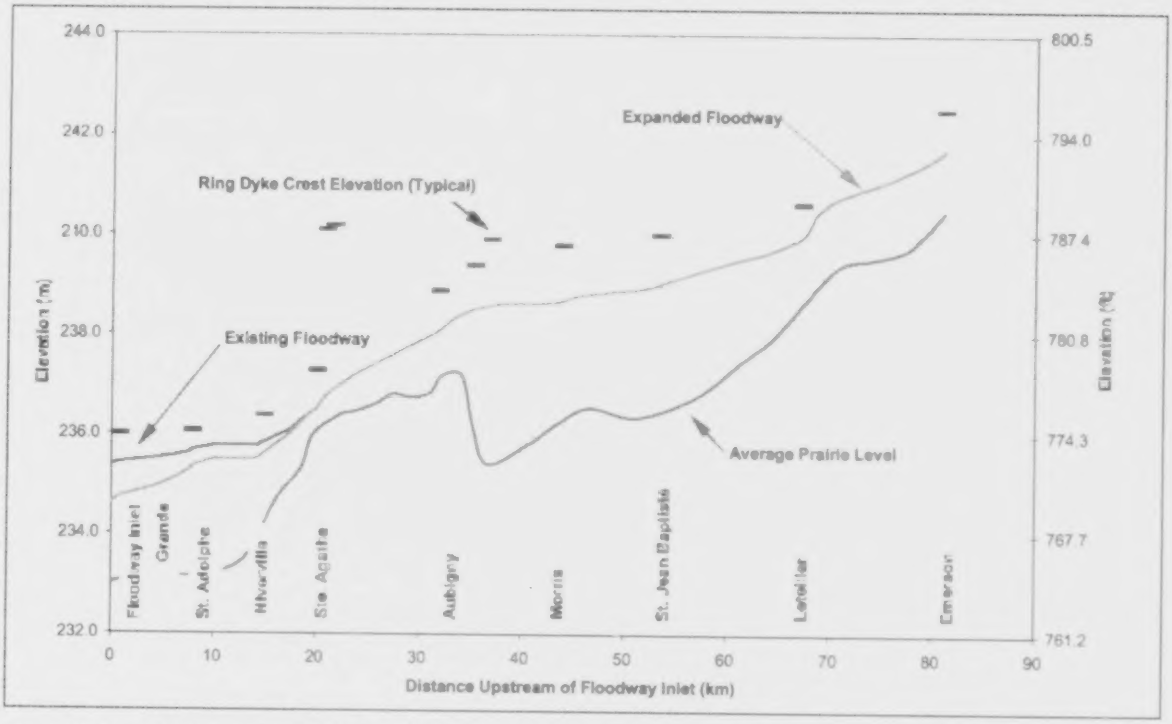


Figure 3-4: upstream water levels in a 1-120-year-flood comparing existing and expanded Floodway.

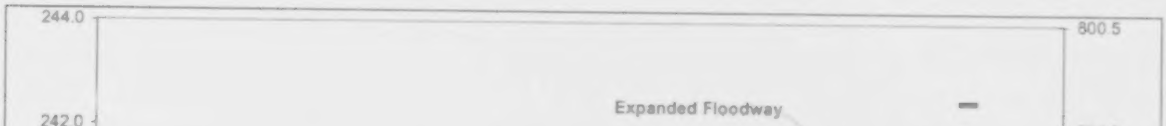


Figure 3-5: upstream water levels in a 1-225-year-flood comparing existing and expanded Floodway.

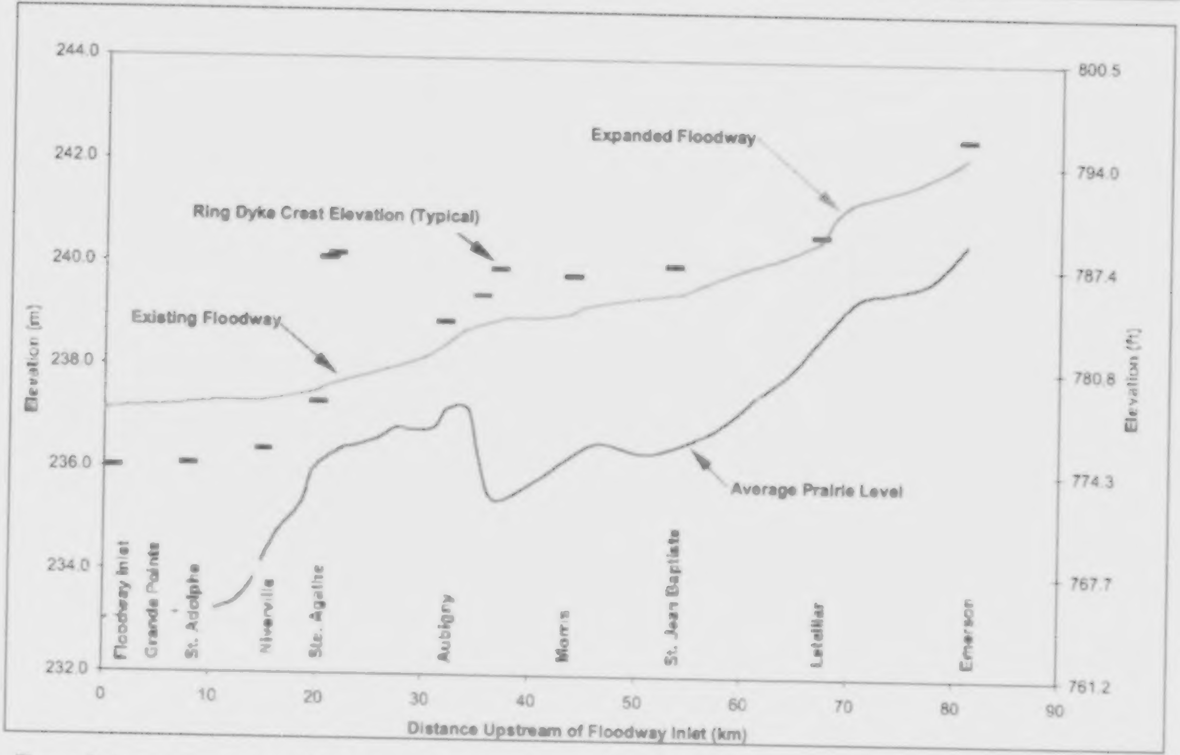


Figure 3-6: upstream water levels in a 1-700-year-flood comparing existing and expanded Floodway.

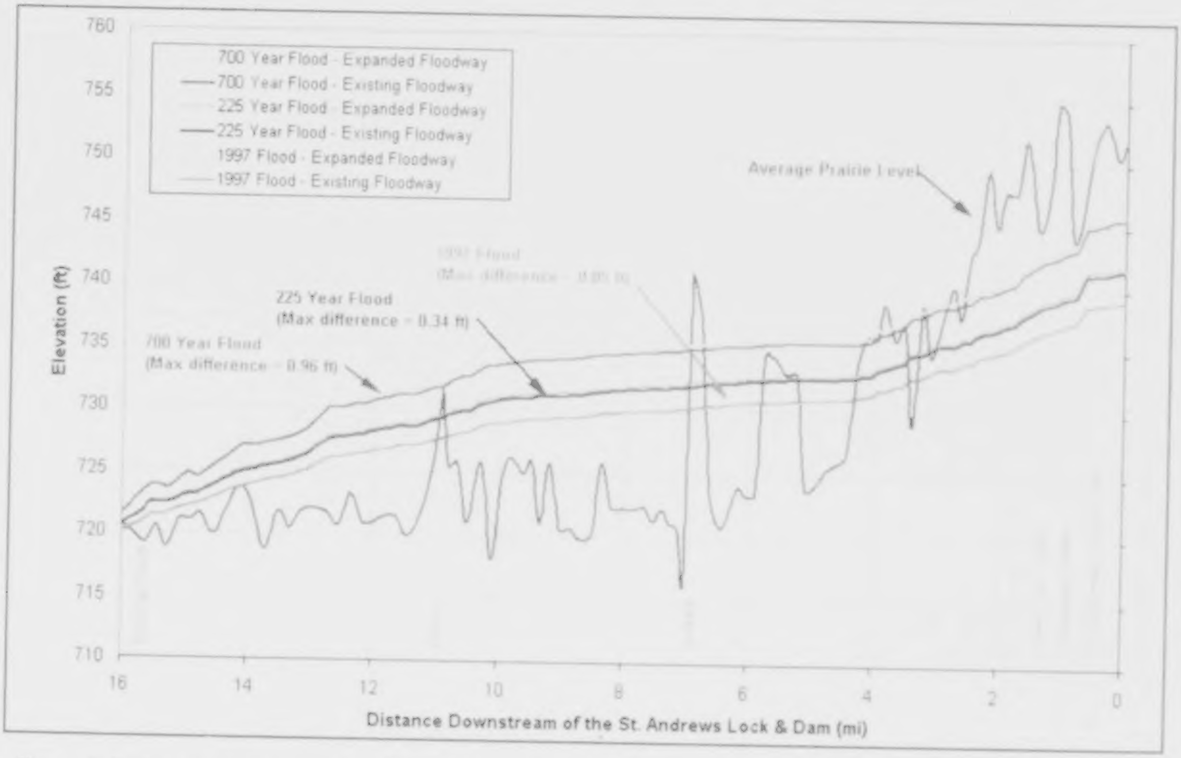


Figure 3-7: downstream water levels in a 1-120-year-flood comparing existing and expanded Floodway.

particularly impacts on the quantity and quality of groundwater.

Prior to the introduction of these measures, the main form of assistance available to flood victims in Manitoba came through the Disaster Financial Assistance (DFA) program. The following section of this chapter will describe the DFA, the way it operated in 1997, and then outline the three new compensation measures. Commentary on these measures will appear in Chapter 6.

3.17.1 The Disaster Financial Assistance program

Disaster Financial Assistance is generally provided to compensate local governments, individuals, full-time farmers, small businesses, and some non-profit organizations for excessive recovery costs associated with a natural disaster. It is a federal-provincial program administered by the Manitoba Emergency Measures Organization (EMO). The DFA is generally for the following:

- Pre-emptive costs such as construction of temporary dykes and the operation and/or removal of water pumps.
- Evacuation costs.
- Restoration to a pre-disaster condition: this includes replacement or repair of essential items, repair or replacement of structural damage, and clean up and removal of debris.

Assistance is not available for the following:

- Insurable losses.
- Costs recoverable through an existing government program.
- Losses recoverable at law.
- Non-essential items (luxury items, recreation property, lawn and garden damage, fences).
- Loss of income and opportunity or inconveniences.
- Normal operating costs.
- Upgrading of existing facilities.
- Damages that are a normal risk of trade, occupation, or enterprise.

In addition, the DFA program:

- Restricts the types of property damage for which assistance may be provided to an approved list of necessities.
- Pays on proof of replacement, rather than proof loss, as is the case with *The Red River Floodway Act*.
- Does not compensate economic loss.

Prior to 1997, the maximum assistance on private claims was 80 per cent of eligible costs to a maximum of $30,000. During the 1997 flood, the ceiling was lifted to $100,000. In August 1998, following the determination by the Manitoba Water Commission that there had been artificial flooding upstream of the Inlet Control Structure during the 1997 Flood, the $100,000 limit was removed for all flood victims, whether or not they had experienced artificial flooding. The waiving of this limit was announced as a one-time only event. To encourage people to take advantage of the federal-provincial flood-protection program in the Red River Valley, which required that the property owner make a contribution of 25 per cent of the cost (up to $10,000) on expenditures under $70,000 and 100 per cent of the cost over $70,000, the DFA dropped its requirement that applicants pay 20 per cent of the cost of eligible claims if they also applied to the flood-proofing program.

3.17.2 *The Red River Floodway Act*

To address artificial flooding caused by the Red River Floodway during spring emergency operations, the Manitoba legislature passed *The Red River Floodway Act* in 2004. However, its regulations have not been released, nor has the legislation been proclaimed. The details of the Act are discussed in greater detail in Chapter 6.

3.17.3 The MFA's proposed compensation for flooding north of the Floodway outlet

The Environmental Impact Statement (EIS) states "to the extent that flood mitigation was not fully effective during a flood event, MFEA is committed to ensuring that flood compensation will be provided to those adversely affected by incremental flooding caused by the project." No further information was provided.

3.17.4 Compensation related to non-spring emergency use of the Floodway

As noted in the previous chapter, Rule 4 stipulates that, "The Department will maintain a program of compensation for damages suffered by landowners from flooding caused by floodway operation under this rule."

3.18 Conclusion

As noted previously, based on information provided in the EIS, in supplemental filings, and through the hearing process, the Commission is recommending the licensing of this project. The information in this chapter makes it clear that the MFA is proposing a well-engineered project that dramatically improves flood protection for the City of Winnipeg. By widening rather than deepening, the MFA has attempted to address groundwater concerns and, while it has not eliminated artificial flooding, the proposed expansion has reduced its frequency and magnitude. The Red River Floodway is a significant piece of Manitoba infrastructure; the expansion MFA project not only expands the Floodway, it enhances it.

Chapter 4

Environmental impact assessment

4.1 Introduction

In making its decision as to whether it should recommend licensing the Project under *The Environment Act*, the Commission was tasked with considering the Environmental Impact Statement (EIS) for the Red River Floodway Expansion Proposal along with any related public concerns that were expressed during the hearing process. For that reason, the EIS is a key document in the assessment process. The EIS is, in fact, made up of several volumes: a main report, a public consultation appendix, technical appendices, the supplement filings, and additional technical reports. In preparing the EIS, the Manitoba Floodway Authority (MFA) and its consultants were expected to follow the EIS Guidelines approved by the Project Administration Team (PAT). This chapter describes those guidelines, the approach that the MFA took to preparing the EIS, and the issues that arose during the hearings in relation to the EIS.

4.2 The EIS guidelines

The EIS Guidelines prepared by the PAT describe the intent and scope of the required assessment, the regulatory framework, and public consultation requirements. It also outlines expectations regarding description of the project, of the existing environment, of environmental and socio-economic effects, and of mitigation, of residual effects, of monitoring, follow up and management, and of sustainability.

The Guidelines describe the scope of the EIS as follows:

> The environmental assessment for the Project shall include consideration of the environmental effects of all undertakings associated with the site preparation, construction, maintenance, operation and the final disposition of all components of the proposed Red River Floodway expansion, including any required infrastructure modification or development. The assessment must consider the purpose of the project and alternative means of carrying out the project that are technically and economically feasible.

The Guidelines list the issues that must be taken into consideration in examining the Floodway expansion, including (but not limited to) the following:

- Potential changes to the environment.
- Impact on climate change and Manitoba's commitment to the Kyoto Accord.
- The environmental effects of potential malfunctions or accidents.
- The environmental effects of any alternative means of carrying out the Project that are technically and economically feasible.
- Cumulative environmental effects.
- The adequacy of measures proposed to mitigate adverse environmental effects of the Project and to address residual adverse effects, where appropriate.

In outlining the way in which the EIS should describe and assess effects and mitigation, the Guidelines state:

> The environmental impact statement shall provide information on all environmental, social and economic effects including socioeconomic effects arising from the biophysical effects associated with the Project, including effects on public health and safety. Both positive and adverse effects shall be described quantitatively and qualitatively.

Adverse effects are to be examined according to their nature, magnitude, duration, frequency, reversibility, whether they are short term or long term, whether they are site specific, local or regional, their ecological context, and whether they are in compliance with existing legislation, regulations, and policies. The EIS Guidelines also state:

> Cumulative effects assessment (CEA) shall form an integral part of the environmental and socio-economic assessment. The cumulative effects assessment shall examine all effects that are likely to result from the Project when they are anticipated to occur in combination with other projects or activities that have been, or will be carried out.

4.3 The MFA description of the environmental assessment process

The EIS identifies potential environmental effects and their significance, after consideration of the impact of steps to avoid or reduce adverse effects (mitigation) or enhance environmental benefits, monitoring, and follow-up measures. The assessment process emphasized consultation and involvement with potentially affected communities and interest groups. According to the EIS, these consultations contributed to mitigation of adverse environmental and socio-economic effects.

The assessment focused on effects of Floodway construction and preparation and Floodway operation, including maintenance. The operational analysis looked at those periods when the Floodway channel would be inactive (non-flood events) and active (flood events).

While the design life of an expanded Floodway before a substantial refurbishment is between 50 and 100 years, there is no timetable for decommissioning of the Floodway. For these reasons, there has been no assessment of the Floodway's final disposition, as would normally be expected.

The EIS was carried out following a five-step process that included scoping, analysis, identification of mitigation, evaluation of significance, and follow-up.

Scoping: This involved identifying issues of concern, selecting environmental components to be examined, identifying potential sources and pathways of effects from the expansion to each environmental component, identifying spatial and temporal boundaries for assessing effects for each selected environmental component, and identifying other actions and effects pathways that might affect the same environmental components.

Analysis of effects: This involved collecting baseline data for each environmental component, and assessing the effects of the expansion, including cumulative effects, on the selected environmental components.

Identification of mitigation: This step sets out recommended mitigation measures.

Evaluation of significance: This step evaluates the significance of residual effects (that is, adverse effects after consideration of full recommended mitigation) likely to result from Floodway expansion. This may involve comparing residual effects against thresholds for an environmental component or with land-use objectives and trends.

Follow-up: This step sets out recommended monitoring and effect management measures.

The current environment with the existing Floodway and the projected evolution of this environment without the expansion was used as the baseline for assessing the environmental effects of the expansion. The decision to establish this particular baseline was the subject of considerable discussion during the hearing. Potential environmental effects of the expansion on this existing environment were predicted separately for each environmental component by comparing what would be expected without expansion with what is expected to happen with expansion.

Temporal and geographic boundaries were identified separately for each environmental component based on predicted links between the Project and each environmental component. The time periods examined in the assessment include the Project construction period (2005-2009), and the operations period (after 2009).

The EIS made use of two sets of geographic boundaries: a Flood Study Region and a Special Environmental Effects Region. The Flood Study Region extends through the Red River Valley from just north of Morris in the south to the southern tip of Lake Winnipeg. On the east, the Flood Study Region extends to Highway 12 and then follows the southern boundary for the Rural Municipality of Taché. On the west, the Flood Study Region extends to the eastern border of the Rural Municipality of St. François Xavier and includes the Rural Municipality of Macdonald. (Figure 4-1.)

Aside from periods of major flooding, the geographic scope for effects on the biophysical environments and heritage resources during construction and most years of operation were restricted to the expanded right-of-way and any other required land acquisition areas and certain other areas located adjacent to specific elements of the Floodway. In contrast, socio-economic effects related to construction benefits extend throughout the Flood Study Region and the overall economies of Manitoba and Canada.

The EIS stated that the assessment used scientific analysis of ecosystem effects, along with local knowledge and available experience, in determining environmental and socio-economic effects and their significance.

4.3.1 Public consultation

4.3.1.1 Stages of consultation

Prior to submitting the EIS, the MFA completed three stages of public involvement in 2004.

- Round One (January to March, 2004) informed the public about the process and schedule for the environmental assessment, provided a description of the Floodway expansion project, and identified and confirmed issues/concerns about the consultation process and the Floodway expansion project.
- Round Two (April to May, 2004) provided information and perspectives on key Project elements, including compensation, water levels, recreation and economic opportunities, mitigation, Floodway operating rules, summer operation and ongoing communication beyond the environmental impact assessment process.
- Round Three (May to June, 2004) presented initial environmental-impact assessment findings, in terms of the features, potential effects, and potential mitigation of Floodway expansion.

These consultations were intended to involve potentially affected communities and segments of the public, including municipal councils, local citizen groups, environmental non-government organizations, and local residents in the rural municipalities (RMs) of Morris, Macdonald, Ritchot, Taché, Springfield, St. Clements, East St. Paul, St. Andrews, and West St. Paul, the towns of Niverville and Morris, and the cities of Selkirk and Winnipeg. Opportunities for participation were also provided for other individuals, organizations, and communities with an interest in the Project. The EIS reported that a separate process had been established to involve potentially affected and interested Aboriginal communities and peoples. Three First Nations and the Manitoba Métis Federation (MMF) were invited to participate in consultation and involvement. According to the EIS and the MFA presentation at the hearing, consultation has taken place with

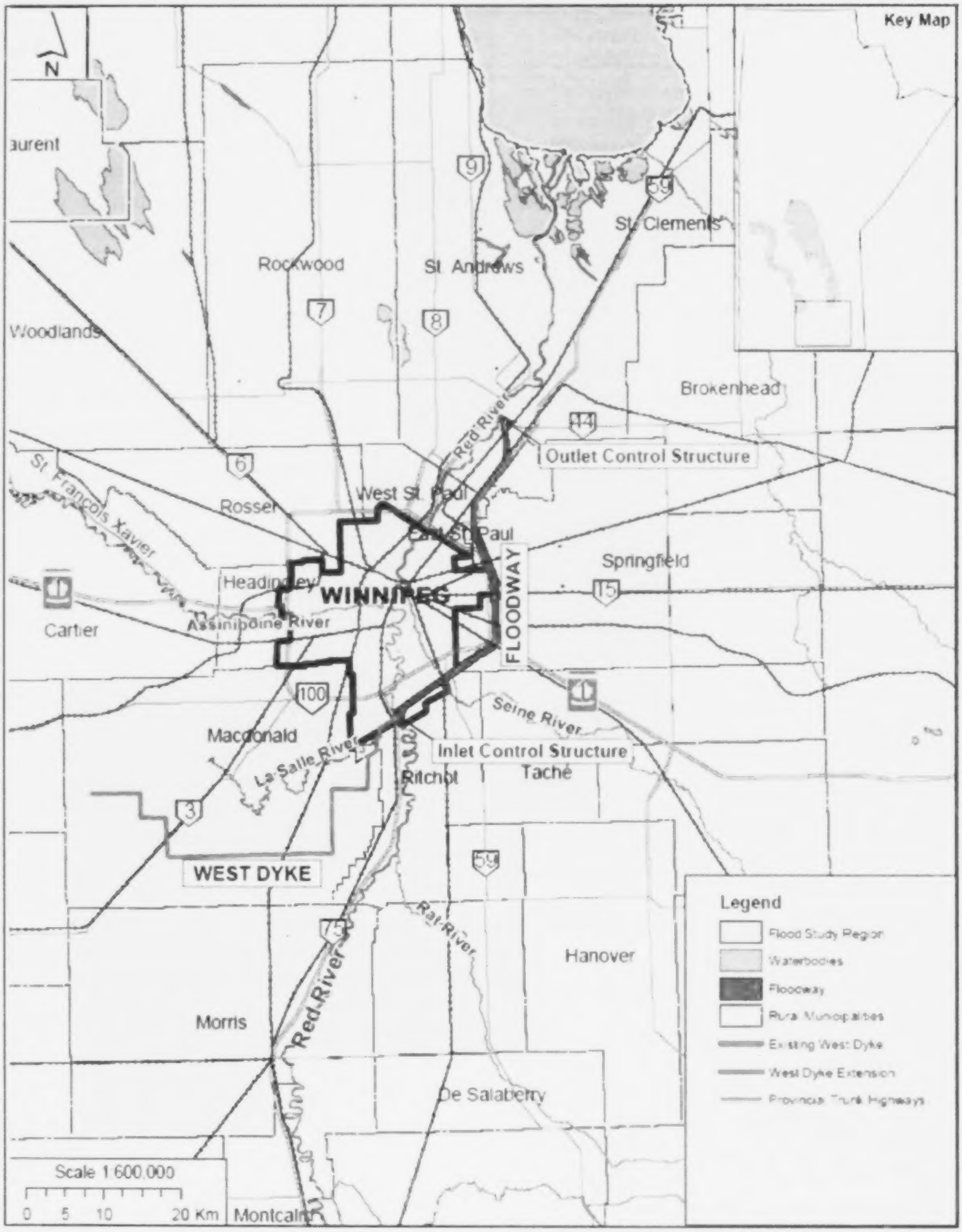

Key Map
N
aurent
Rockwood
St. Andrews
St. Clements
Woodlands
Brokenhead
Red River
Outlet Control Structure
St. Francois Xavier
Rosser
West St. Paul
East St. Paul
Springfield
Headingley
WINNIPEG
FLOODWAY
Cartier
Assiniboine River
Seine River
Macdonald
La Salle River
Inlet Control Structure
Ritchot
Taché
WEST DYKE
Rat River
Hanover
Red River
Morris
De Salaberry
Montcalm
Scale 1:600,000
0 5 10 20 Km
9
59
7
8
44
6
15
1
100
3
59
75
Legend
Flood Study Region
Waterbodies
Floodway
Rural Municipalities
Existing West Dyke
West Dyke Extension
Provincial Trunk Highways

Figure 4-1: EIS Flood Study Region

the Peguis First Nation and the MMF over a range of issues relating to the Floodway.

There was a fourth opportunity for public input following the release of the draft EIS in August 2004. Beyond these measures the MFA committed itself to:

- Discussions with Manitoba Aboriginal communities and peoples regarding potential effects on Aboriginal land, employment training, and business development opportunities, along with various other Project elements.
- An ongoing public involvement program at least to the end of the construction phase.
- Regular distribution of newsletters and progress reports beyond the environmental licensing process and additional public opinion research.
- Regular updates and progress reports via direct mail to stakeholders and interested residents at least six times each year.

4.3.1.2 Issues raised

The EIS divided the issues raised by the public into the following four categories:

1. Effects related to Floodway Expansion: effects potentially caused by construction, existence, or operation during a flood event of the proposed expansion. The EIS concluded that these effects were within the scope of what it assessed and considered for mitigation.
2. Effects related to the Existing Floodway and Flood Management: These effects would exist in the absence of Floodway expansion and, therefore, were judged by the MFA to be not a result of expansion. Accordingly, most of these effects were seen to be outside the scope of what was assessed and considered for mitigation in the environmental impact assessment. However, many of these items are included in the existing environment and related cumulative effects portions of the assessment.
3 Related to Floodway Expansion Environmental Impact Assessment (EIA) and public-involvement program: These pertained to the scope, approach and process for conducting the Floodway Expansion environmental impact assessment and public involvement program.
4 Other Round Two [of the Consultation Process] Issues: these included legislation and policy matters, operating rules, and benefits policies related to the expansion.

4.3.1.3 MFA responses

In response to these consultations, the MFA indicated that it had made a number of changes to the design of the expansion project. In particular,

- In response to concerns about impact on groundwater, the proposed deepening of the Floodway was eliminated.
- An $11-million environmental mitigation fund was proposed to address concerns raised about unforeseen and unanticipated effects of Floodway expansion, including effects on groundwater.
- Improvements were made to the design of agricultural drainage drop structures to accommodate increased flows and future growth of the local drainage system.
- An agreement has been made to twin the new Highway 15 bridge over the Floodway.
- Land acquisition requirements for disposal piles of excavated materials from the Floodway Channel were reduced from over 405 hectares to a maximum of 202 hectares.
- The MFA committed itself to consulting with municipalities about proposed Floodway recreation projects that would be located in their area.
- The Springhill Ski Facility would not be required to relocate or close its operation during Floodway expansion or operation.
- The MFA committed itself to providing the public with access to the excavated soil from the Floodway Channel.

- The MFA committed itself to working with local residents and municipalities in developing detailed plans to raise the West Dyke and determining the best approach to drainage structures in the RM of Taché and the Cooks Creek Conservation District.

Additional analysis and studies were undertaken in the following areas to assess issues and concerns raised during the public involvement process:

- Implications on downstream water levels during a severe flood event in the Red River near Lower Fort Garry.
- Potential for surface water intrusion into groundwater when the Floodway is operating during a flood event, with particular emphasis on the area from Birds Hill to Lockport.
- Effects of sediment during construction and operation of Floodway expansion on Red River water quality and the need for dredging.
- Effects of Floodway expansion widening on Birds Hill aquifer and measures to minimize influence on groundwater.
- The nature of ice jams downstream of the Floodway outlet and effects on downstream ice jams of Floodway expansion water levels and flows.
- Analysis of where uncertainty of physical effects of Floodway expansion could affect conclusions in the Environmental Assessment.

In response to the perception that the Floodway provided residents of the City of Winnipeg with a level of flood protection not available to those outside the City of Winnipeg, the MFA indicated that it would encourage Canada and Manitoba to consider investments in rural flood protection – particularly north of Winnipeg.

4.3.1.4 Commission observations on the public consultation

It is clear that the MFA conducted an extensive series of meetings both before and during the EIS process. Many of the members of the public who made presentations to the Commission expressed a range of views about the effectiveness of this consultation process. While several witnesses spoke positively about their interactions with MFA representatives, others, including the reeves and mayors of the municipalities through which the Floodway passes, were very critical. The greatest frustration was expressed by individuals who concluded that the MFA's interpretation of the *Environmental Impact Statement Guidelines* effectively defined their concerns as being out of scope. They tended to see the MFA as a large, insensitive public agency that was unprepared to deviate in any significant manner from its definition of its mandate.

It is clear the MFA did undertake extensive consultations. However, it is not surprising that, given the fact that many issues that individuals sought to raise about the operation of the current Floodway were viewed by the MFA as being out of scope of the proposed expansion, some participants were frustrated by the consultation process and concluded it to be ineffective. It is clear that the MFA and its representatives are committed to carrying through important works that have been determined to be in the public interest in an efficient and timely manner. Along the length of the Floodway there are communities of individuals who, because of their interaction with government over Floodway-related issues, have come to view government statements and intentions with distrust. It would be unfortunate if the process surrounding Floodway expansion heightened this distrust of government and public service.

4.3.2 Cumulative effects assessment

The EIS stated that a cumulative effects assessment was done concurrent with all other elements of the environmental impact assessment and that no distinction was made between the cumulative effects assessment and other elements of the EIA. It stated that this approach was consistent with the EIS guidelines and the *Canadian Environmental Assessment Act.*

In its discussion of the cumulative effects assessment for this Project, the EIS quoted Section 16 of the *Canadian Environmental Assessment Act*

(CEAA), which states that comprehensive studies of a project should include:

> a. the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out; and
>
> b. the significance of the effects referred to in paragraph (a)

The EIS also quoted Section 2.1 of the *Cumulative Effects Assessment Practitioners Guide*:

> Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions.... [... This definition is intended specifically for single-project assessments as opposed to regional planning (in which case there is not necessarily a single project that serves as the starting point and focus of the assessment), and borrows the broad definition of 'environment' as used in the [CEAA].] A [cumulative effects assessment] is an assessment of those effects.

Past and current projects and activities were considered to form an integral part of the existing biophysical/ecological environment against which predicted effects are assessed. As such, the EIS stated that these past and current projects and activities, along with their projected future levels, were accounted for in the assessment of Project effects.

4.3.3 Significance

The EIS description of residual effects includes a characterization and rationale as to whether residual environmental effects are significant or insignificant. The EIS stated that scientific analysis of ecosystem effects was considered along with local knowledge and available experience in determining the significance of potential effects.

Duration, magnitude, and geographic extent were used as key assessment components for the initial socio-economic significance analysis for any specific component of the environment affected by the Project.

The EIS concluded there were no significant adverse effects associated with any aspect of the Project once required mitigation measures were taken into account.

4.4 The debate over cumulative effects assessment

From the outset of the hearing, there was debate over adequacy of the approach that had been taken to the cumulative effects assessment. The MFA took the position that it had met the requirements of the EIS Guidelines, while participants and members of the public expressed dissatisfaction with the range and scope of the cumulative effects assessment. For a number of participants, an important question was whether, when a project is an expansion of an existing project, it is appropriate to describe but not assess the affects of the existing project. In addition to this issue, the Commission also has a number of broader comments to make on measures that could improve cumulative affects assessment practice in Manitoba.

4.4.1 The MFA position

Aside from its description of the assessment process in the EIS document, the MFA addressed cumulative effects assessment on a number of occasions during the hearing. The MFA cited the *Cumulative Effects Assessment Practitioners Guide* definition of cumulative effects assessment as "An assessment of the incremental effects of an action on the environment when the effects are combined with those from other past, existing and future actions." Section 3.1 of the Guide describes the following three-step process:

> 1. Determine if the project will have an effect on a VEC [Valued Eco-system Component]. [The EIS did not use the VEC concept, but did identify similar

> environmental categories for which effects must be assessed.].
>
> 2. If such an effect can be demonstrated, determine if the incremental effect acts cumulatively with the effects of other actions, either past, existing or future.
>
> 3. Determine if the effect of the project, in combination with the other effects, may cause a significant change now or in the future in the characteristics of the VEC after the application of mitigation for that project. (Cumulative Effects Practitioners Guide (Section 3.1)

The MFA illustrated this approach through a series of charts that indicated that the essential approach was to describe the state of the environment prior to development and then determine the likely impact of the appropriate past, present, and expected future development. This could be used to establish a baseline against which a project could be evaluated, creating a context in which one could assess incremental change. The MFA stated that if there were no assessed change, or if the effect were positive, the cumulative effects assessment did not go on past the first step. If there were an adverse effect, the assessment continued through all three steps. As an example, the MFA described how a slight reduction in groundwater levels along one portion of the Floodway channel was judged, prior to mitigation, to be significant in light of previous reductions in groundwater levels following the construction of the original Floodway. The mitigation in the case provided did not attempt to mitigate the effect of the original Floodway, but to ensure that that effect was not exacerbated by the expansion.

The MFA returned to this question in its closing legal argument. That argument advanced the following propositions:

1. The 1992 *Canadian Environmental Assessment Act* is not retroactive or retrospective. It does not require assessment of projects that were in place when the CEAA came into effect.
2. Under the CEAA, an environmental assessment is a tool that is used to evaluate and assess specific proposed projects. A project can include the modification of an existing facility.
3. The baseline for such an assessment is the "world as it is, and the world as it would evolve absent this project." This means the baseline would include the existing Floodway, the way it is operated, the way it is likely to be operated in the future, and the likely outcomes of such operations.
4. The baseline is to be described but not assessed. This means that the assessors are required to describe the effects of the existing facilities but not assess them as being, for example, significant or adverse. It is only the effects of the proposed project or expansion that are to be assessed in such terms.

On the question of how the Commission could license the operation of the expanded Floodway, even though only the effects of the existing Floodway were being described but not assessed, the MFA presented the following argument:

> Licensing the expanded Floodway doesn't mean we are going backwards in time and saying everything that was done before was ideal or proper or just. The principle of environmental assessment is done on a go-forward basis, these statutes aren't retrospective or retroactive. The symbolic meaning people should not be taking from licensing the new Floodway is that this body has gone back in time and said everything that happened in the past is copasetic, or this body is saying things couldn't have been done better in the past.

4.4.2 Presenter positions

Numerous individuals and organizations that appeared before the panel challenged the MFA interpretation. The common thread in each of these presentations was that the cumulative effects assessment should have assessed the effects of the operation of the existing Floodway along with the effects of the expansion on operation. For example, in its submission the North Ritchot Action Committee (NRAC) was particularly critical of the EIS determination that "the existing floodway and its mode of operation, ancillary flood control structures west of Winnipeg, and Winnipeg's infrastructure are static features of the baseline environment from which expansion can be assessed." Instead, NRAC argued that the expanded Floodway should be seen as replacing the existing Floodway and that all environmental impacts arising from the expanded Floodway be included in any cumulative assessment. Because of this shortcoming, NRAC recommended that the Commission refer the Project to a federal review panel.

The Ritchot Concerned Citizens Committee (RCCC) argued that the EIS did not adequately investigate the long-term effects of artificial flooding caused by Floodway operation (the issue of artificial flooding will be discussed in Chapter 6) and the increased uncertainty created by other Floodway operations. The RCCC brief took the position that these issues were not adequately addressed because the cumulative effects assessment determined them to be part of the baseline (that is, they are part of the world that would exist whether or not the Floodway were expanded).

The rural municipalities of Springfield, St. Clements, and East St. Paul also took the position that the EIS was fatally flawed because the cumulative effects assessment had not given appropriate consideration to the impacts of the existing Floodway as well as the proposed expansion.

4.4.3 Commission comment

In respect to the specific issues relating to cumulative effects assessment that were raised at this hearing, the Commission accepts the MFA position that, in conducting a cumulative effects assessment, it is necessary to describe, but not necessarily assess the effects of previous projects. While the cumulative effects assessment, in this case failed to meet the expectations of many in the community, it does conform to the technical requirements as set out in the EIS Guidelines.

The Commission does not believe that this was necessarily the most important question relating to cumulative effects assessment to arise at this hearing. In the report on the Wuskwatim project (September 2004) the Commission made a number of observations and recommendations respecting cumulative effects assessment. These included comments to the effect that there is substantial room for improvement in this type of assessment and that the Commission expects broader cumulative effects assessment in the future. The Commission also recommended that "The practice of environmental assessment be enhanced by requiring higher standards of performance. In this regard the Government of Manitoba should … establish protocols for best professional practice that includes cumulative-effects assessment."

In large measure the lack of a protocol contributed to uncertainty in the hearings as to what constitutes "best professional practice." There is no definition of cumulative effects in either *The Manitoba Environment Act* or in the *Canadian Environmental Assessment Act*. A definition commonly used, however, is

> **Cumulative environmental effects are environmental effects which result from effects of a project when combined with those of other past, existing and imminent projects or activities.**

Cumulative effects are important because significant environmental effects may result not from the direct effects of a particular project but from the combination of effects of multiple projects over an extended period of time. It has been persuasively argued that the difference between an EIA and a CEA is that in the first case an EIA might ask: what might my project do to selected valued eco-system components? A cumulative effects assessment would ask: what contribution might my project make to the effect of the overall suite of stresses on selected VECs?

The Commission makes the following observations:

- That it is necessary to take a broad perspective of guidelines and the definition of environmental effects at all times and that this is particularly the case in communities that may have been impacted by past projects and are clearly anxious about a new project that is to be combined with an existing project.

- Proponents should be aware that failure to fully tell the story of individuals and communities impacted by previous projects suggests to those individuals and communities that their problems and the effects of past projects are not well understood by the proponent, and by implication, results in an inability of the proponent to properly assess cumulative environmental effects. In the case at hand, upstream residents clearly felt their story had not been reasonably presented in the EIS.
- Guidelines should be given a broad interpretation and, where public opinion has expressed concern about other past or future projects, the effects of those projects should be described and considered in detail as to how they might combine with effects from the current project.

Non-licensing recommendations

4.1 Guidelines for projects seeking a licence under *The Manitoba Environment Act* be more prescriptive as to what would constitute an acceptable cumulative effects assessment.

4.2 The practice of environmental assessment in Manitoba be enhanced by requiring higher standards of performance. In this regard, the Government of Manitoba should:

- Enact environmental assessment legislation.
- Provide comprehensive and clear guidance for proponents, consultants and practitioners.
- Establish protocols for best professional practice that includes cumulative effects assessment.

The environmental assessment process shall include use of traditional and local knowledge, selection of appropriate valued environmental components, establishment of baseline conditions, and establishment of thresholds in the conduct of environmental assessments. The protocols should reduce uncertainty, enhance effectiveness and improve predictability of future environmental assessments.

4.3 The Government of Manitoba facilitate a mandatory cumulative effects workshop with proponents and potential interveners, especially for projects likely to end up in a public hearings process.

Chapter 5
The issues as expressed by the public

5.1 Introduction

As noted in Chapter 1, public hearings, as facilitated by the Commission, are integral to Manitoba's environmental review process. The Floodway hearings demonstrated the value of this approach. The hearing process provided individuals and communities who have been or will be affected by the Floodway with a public forum to describe their experiences and their concerns. This was not always easy; it was often evident that presenters and participants found it difficult and stressful to relive their flood experiences. Individuals and community organizations also suggested ways in which the Floodway expansion could be enhanced—for example to improve rural drainage, the public road system, or water flows in the Seine River. Their efforts broadened the context within which the Commission came to view Floodway expansion. The Commission wishes to make it clear that these public presentations made by either private citizens or organizations of private citizens played an important role in bringing important issues before the Commission.

The technical advisers engaged with the help of the Participant Assistance Program played an equally important role in identifying areas of concern and methods to deal with those concerns. Their presentations served as a significant stimulus to debate and furthered the process. The political leaders of the four municipalities most directly affected by the Floodway were present throughout the hearing, monitoring and commenting on a process and a project that could have significant impact on their communities. Three of the rural municipalities also combined to retain outside consultants, a move that further enhanced the hearings. The reeves' and mayor's consistent presence was a sign that the review process was taken seriously by the public.

This chapter is intended to provide a brief accounting of the main issues and questions that members of the public raised at the hearing. Because many presenters raised similar issues, the Commission will not summarize each of the presentations. Subsequent chapters of this report deal with a number of these issues in greater detail and also make reference to the testimony and submissions made to the Commission. While not all specific questions and issues are directly addressed in the following chapters, the report does discuss all the key issues that fall within the Commission mandate.

5.2 Artificial flooding

Artificial flooding results when Floodway operations raise water levels above the natural level. (The concept is discussed and described in Chapter 2.) Whether as a result of spring emergency operations or non-spring emergency operations, artificial flooding was the central concern of presenters and organizations from upstream of the Floodway.

Many residents questioned whether the Manitoba government had the legal authority to subject private land to artificial flooding. They believed that the practice should be banned and that the Floodway should be engineered in a fashion that made it unnecessary. It was felt there was a need for a public review of the operating rules in light of the proposed Floodway expansion and the introduction of non-spring emergency operations. Presenters also proposed that community organizations be granted direct representation on any body reviewing the Floodway operating rules. If artificial flooding were to continue, many residents believed there was also a need for easements, buyouts, or some general negotiated agreement with the residents who would have an increased risk of being flooded.

Many of the people who spoke said that they recognized that, in certain situations, it might be necessary to subject communities upstream of the Floodway to artificial flooding in order to protect the City of Winnipeg. However, they believed that, in such situations, their interests were being sacrificed, that they ought to be properly compensated, and that the compensation should be provided in a spirit that recognizes their sacrifice. As a result, a key concern in relation to artificial flooding was the need for full and fair compensation for artificial flooding—both in the past and the future. Numerous reservations were expressed about *The Red River Floodway Act*. In particular, residents felt that appeals to decisions made under its provisions should be heard by a neutral third party. When the natural level is computed for the purposes of determining if artificial flooding has occurred, presenters said the natural level should be adjusted downwards to take into account variability in the existing model. There was also considerable uncertainty about the effectiveness of the Act, due to the fact that the Act had not been proclaimed at the time of the hearing nor had its regulations been published. There was also a fear that people would end up in lengthy and stressful disputes with government agencies in the future when they sought compensation for artificial flooding. This was compounded by a concern that they might end up in disputes as to whether damage was the result of natural or artificial flooding. People also expressed the view that there had been a lack of recognition of the amount of time people lost from their lives going through the compensation process following the 1997 flood.

The artificial flooding that accompanied the introduction of non-spring emergency use in 2002 was a subject of considerable discussion. People spoke of their difficulties in having summer flooding properly assessed and compensated.

People also identified what they viewed as gaps in the research that had been done on Floodway operation. For example, they called for study of the long-term social and economic effects on people whose properties had been damaged by artificial flooding and the impacts of regular non-spring use of the Floodway, including damage to trees and wildlife, riverbank erosion, mosquito breeding, weed growth, and reductions in property values.

Some presenters wanted to know if the Floodway could be operated in a fashion that provided the residents upstream of the Floodway with some of the benefits of the reduced river levels as a result of the Portage Diversion and the Shellmouth Dam. By excavating more of the Channel immediately downstream of the Floodway inlet or removing the weir at the inlet, they said, it might be possible to reduce artificial flooding upstream of the Floodway.

Some presenters were troubled that City of Winnipeg flood protection infrastructure improvements had been declared out of scope, since the presence or absence of those improvements could impact on the operation of the Floodway and the level of artificial flooding. This was coupled with irritation that the City of Winnipeg was not contributing to the Floodway expansion even though residents of rural Manitoba had been required to make a substantial financial contribution under the earlier Red River Valley Flood Proofing and Dike Enhancement Agreement.

Issues of trust in government arose in relation to the Floodway operating rules. Several presenters pointed to a government publication from the mid-1990s that indicated that Floodway operations would not result in artificial flooding. The fact that the operating rules had been changed in the middle of the 1997 flood led many to question whether the operating rules were hard-and-fast rules as the Manitoba Floodway Authority (MFA) claimed.

People also asked for measures that could be taken to assist them in protecting their homes during a flood. Presenters asked if there could be ways to improve access to their homes during periods of artificial flooding and if adequate protection would be given to the power sources they would need to keep their pumps working during a flood.

5.3 The effects of being flooded

There can be no doubt that the most compelling testimony came from people who had been flooded. The evidence that they gave spoke to the efforts and courage involved in protecting one's home or the home of a loved one and family member. There also were stories of uncertainty and confusion, as people had to make crucial decisions about the future of their home with very little notification. There were stories of helplessness and heartbreak, as people put in long strenuous hours in an effort to save their homes at a time when they did not have the power to influence crucial decisions that were being made about water levels in the Red River Valley. In some cases, homes were saved from flooding, only to be lost to mould infestations and the serious health effects related to it months later.

One of the issues raised several times was the mental-health impacts of artificial flooding. This involved feelings that arose from the fact that property and possessions had been flooded, not by acts of nature, but by acts of government policy. Furthermore, the introduction of non-spring emergency operations and the prospect that the Floodway might be operated during the summer to keep the Forks walkways above water meant that people faced the increased likelihood of often having their land flooded in the future. The fact that people would have to continue to apply for compensation on a regular basis was in itself stressful.

Presenters said that, in its response to the 1997 flood, the Manitoba government had shown little understanding of the emotions and stress that survivors experience post-disaster. As a result, there was little recognition of the need to assist people in reconstructing their lives or to provide support for the caregivers, to ensure that they did not give way to burnout and cynicism. People often found themselves forced to make decisions with respect to rebuilding their homes without adequate engineering, architectural, and financial advice. For this reason, some people claimed they had been saddled with poorly designed flood proofing measures and with very high debt loads. One presenter said people rebuilt only to conclude that the best decision was to agree to a buyout.

The Commission was told that many upstream residents are suffering long-term health effects and long-term debt as a result of uncompensated losses and have lost any hope of retirement or vacation. In some cases they have been left to carry two mortgages, one on the destroyed home and one on the new home. There was also testimony to the effect that post-1997 flood proofing has scarred the land. People said that trees have been lost, the grades on flood-protected properties are so steep that driving is difficult, particularly for emergency vehicles, and that the ponds that have developed in the pits where the clay for mounds came from are health-and-safety risks. Residents found this damage to the natural environment very depressing and said they no longer recognized their community.

The Commission was not conducting an investigation into the aftermath of the 1997 flood and does not wish to draw any firm conclusions on those events. However, it would be accurate to state that, during this hearing, many people appeared to present detailed and well-reasoned arguments as to why they feel that issues from 1997 remain unresolved.

5.4 Groundwater concerns

Presenters and participants from the rural municipalities (RMs) of Springfield, East St. Paul, and St. Clements raised concerns about the possibility that Red River water in the Floodway could make contact with the aquifers that supply their ground water. In addition, they were concerned about the fact that, by intercepting the aquifer flows, the Floodway contributed to a loss of valuable water and that there did not appear to be any proposals in place to reduce that loss.

Presenters stated that the establishment of a proper baseline of groundwater conditions is a prerequisite for Floodway expansion. Reference was made on several occasions to the outflow of raw sewage from a City of Winnipeg sewer into the Floodway channel and the concerns people had that this water could contaminate local aquifers. In some cases, individuals wanted to know why their wells were not being tested as a part of the establishment of a baseline.

While the MFA had committed itself to establishing an $11-million mitigation fund, many residents wanted more information on the administration and adequacy of this fund They sought assurance that there would be an adequate groundwater monitoring system and that groundwater mitigation would be easily accessible. Many presenters said the MFA should set up a 24-hour hotline for local residents to call in the case of groundwater problems. There was a worry that groundwater claims would lead to lengthy legal battles in which they would be obliged to demonstrate that it was the Floodway that had compromised their groundwater quality. Finally, people wanted an arms-length organization established to adjudicate their groundwater complaints.

5.5 Ice jams

Residents and municipalities downstream of the Floodway Outlet Structure had a number of concerns related to the impact of ice-jams on the Red River and the floods that these jams could create. In particular, they believed that the increase in the frequency of ice jams on the river since the construction of the Floodway suggested that the operation of the Floodway contributed to ice jamming. Presenters also argued that far less is known about flooding downstream of the Outlet Structure than is known upstream of the Inlet Structure. As a result, they felt that they had been excluded from Red River Valley flood-protection planning. The group also stressed that many more communities than the City of Selkirk were affected by ice jam flooding. They said that the affected communities included East Selkirk, St. Peters, Breezy Point, and Petersfield, along with residents along such water ways as the Waverly, Dubas, Netley and Cooks creeks.

They also worried that efforts to make the Floodway more efficient, for example by creating gaps in the East Embankment, would increase the Floodway's impact on ice jamming. They felt that *The Red River Floodway Act*—which provides compensation when flooding exceeds the natural level—did not provide them with equitable compensation. It was argued that, in 1826, floodwaters had left the Red River north of the current location of the Redwood Bridge and had created a separate channel to the west of the river via Oak Hammock Marsh to Lake Winnipeg. If this had been the case, then the natural level downstream of the Floodway outlet would have been lower. This could, it was suggested, mean that future flooding downstream of the outlet ought be compensated as artificial flooding. In referring to their discussions with the Manitoba government, they stated that a promised ice-jamming fund has yet to be established. They identified a need for study of riverbanks north of the Outlet Structure and of the causes of and possible solutions to ice jamming. The downstream presenters requested permanent flood mitigation provisions, property buyouts of homes threatened with flooding as a result of Floodway operations, upgrades to the Selkirk bridge, and a return to dredging at the mouth of the Red River.

5.6 Other impacts of the Floodway on the communities through which it passes

Residents and political leaders of communities through which the Floodway passes had other concerns besides the potential impacts on groundwater and ice jamming. They spoke of the way that the Floodway had cut a number of municipalities in two, making for longer bus trips for children going to school, difficulties in delivering services (particularly emergency services), and the fracturing of the community. They also felt there needed to be greater clarity as to who would pay for emergency response services during the Floodway construction.

They wished see the low level crossing at Dunning Road replaced with a bridge and spoke of how, when the Floodway was originally constructed, there had been a commitment to construct other crossings. While there was a concern that the construction process could damage local roads, the municipalities particularly welcomed the decision to twin the Provincial Trunk Highway 15 Bridge.

Of particular concern were unauthorized uses of the Floodway channel, when there is no water in the channel. People felt that there is currently no adequate property management of the channel and no attempt to limit or control access to the property. As a result, it is used as a place to abandon vehicles and hold bonfires that spread to private property damaging crops and threatening homes. The municipalities wished to see the MFA made responsible for routine maintenance, safety, security, and environmental protection, including emergency response on Floodway property. While some presenters saw a value in recreation usage, they worried that encouragement of recreational use was of concern when property management was being ignored. A representative of one municipality suggested the Floodway be fenced as a security measure.

The RM of East St. Paul acknowledged that the RM received flood-protection benefits from the Floodway, but was concerned that it was going to be required to pay a portion of the cost of the relocation of water lines under the Floodway. Several RMs were also interested in the Floodway providing additional drainage outlet structures on the west bank of the Floodway.

Finally, the RMs felt that not enough study had been undertaken into the impact that the Floodway had had on development in Red River Valley municipalities and on the local tax base, nor had proper consideration been given to local growth patterns when the Project's effects were being assessed.

5.7 The West Dyke

The realignment and raising of the height of the West Dyke did not generate significant debate. One producer, however, presented several concerns about the impacts that West Dyke strengthening and expansion could have on some agricultural operations in relation to the West Dyke. The first related to that fact that earth for raising the dyke would come from adjacent farmland. In his case, a significant number of hectares of land on which he currently spreads hog manure would be lost to the dyke. While he would be compensated for the lost land, he would have to purchase or lease more land than he was losing to enable him to dispose of the hog manure in accordance with the regulations. Since not all landowners wished to lease land for manure spreading or sell a portion of their land for such operations, he was concerned that he might end up having to buy or lease land a considerable distance away from his hog barn, resulting in increased trucking and operating costs. The Commission recognizes that, in many cases, the dyke will not require as high a ratio of land-per-mile of dyke as was required in this case. However, it also believes that these are important matters and expects that, in its dealings with agricultural landowners, the MFA will recognize and address landowner concerns.

5.8 Recreation

Several organizations made submissions that indicated there was interest in developing the recreational potential of the Floodway, particularly as a location for hiking, cycling, and cross-country skiing. At the time of the hearings, 34 organizations (including two rural municipalities) had signed a memorandum in support of recreational development and participation in the ongoing activities of the Red River Floodway Trail Coalition (an umbrella group formed to promote recreational development of the Floodway lands). Presenters stated that the opportunity existed to develop the Floodway into a tourism destination by building an interpretative centre and linking the Floodway to other trails. Others suggested that motorized recreational vehicles be restricted to one side of the channel, while cycling and hiking trails be constructed on the other side. Some presenters stressed the importance of ensuring that a master plan for recreational development be adopted while the Floodway itself is still in the planning state, while others recommended that the Commission incorporate tourism and recreational provisions in any licensing recommendations. A number of recreation groups indicated that, while they had been involved in consultations with the MFA, they were disappointed by the lack of progress that had been made and by the decision to remove recreation from the scope of the current application to the Commission.

While these constituted the main thrust of the recreation proposals, other presenters focused on specific concerns. The Forks North Portage Partnership requested that the Commission consider an operating regime that would keep the river walks at the Forks above water. The Manitoba Alpine Ski Division supported efforts to have earth that had been excavated as a part of Floodway Expansion used to increase the size of the Springhill ski slope.

Residents living upstream of the Floodway at times expressed reservations about the concept of spending money developing recreation facilities along a structure that visits artificial flooding on some Manitobans.

5.9 Cooks Creek Conservation District

The Cooks Creek Conservation District (CCCD) has the mandate to conduct conservation and resource management activities in the Cooks Creek Area (the rural municipalities of Springfield, Taché, Ste. Anne, Reynolds and Brokenhead). The CCCD said that this area has significant drainage problems in the summer caused by rainfall and that standing water has caused serious crop losses in the past. The CCCD was pleased that the Floodway expansion would involve the upgrading of current outlets that drain local runoff into the Floodway. However, it requested that the drop structures be constructed with the ability to have their capacity expanded in the future. The CCCD also requested that the MFA determine the cost of constructing additional drop structures.

5.10 Common concerns

Many of the people who appeared before the commission, regardless of where they lived, raised the following questions:

- Did the EIS fulfill the appropriate legislative and regulatory requirements?
- Had the MFA been truly responsive to community concerns through the public-consultation process?
- Why were so many issues not going to be resolved until the final design stage of the Project?
- Should the public be allowed to review and comment on the Environmental Protection Plans?
- Should communities affected by the Floodway have representation on the MFA Board of directors?

Many people who spoke indicated that they had lost faith in the government. They welcomed the establishment of various committees, but they noted that committees are useful only if they have some power behind them.

5.11 Unique concerns

A number of submissions highlighted very specific issues, which while in large measure outside the mandate of the Commission, deserve to be described.

5.11.1 Peguis First Nation

The Peguis First Nation has six parcels of Reserve land adjacent to or near the Red River. Furthermore, it is concluding an agreement with the federal and Manitoba governments to return a portion of the former St. Peter's Reserve, which bordered on the Red River, to the Peguis First Nation. The Peguis First Nation submission:

- Identified what it saw as a lack of attention to Aboriginal rights.
- Questioned the way the EIS focused primarily on the Floodway right-of-way in identifying environmental effects.
- Called for a cumulative effects assessment that includes drainage from all creeks and drains that flow into the Red River north of the City of Winnipeg.

The Peguis First Nation submission pointed to the spring flooding that occurs on the Peguis First Nation as a result of water flowing through the Fisher River watershed. Flooding has led to 11 evacuations in the past 30 years. In response to this ongoing problem, the Peguis submission called for a Fisher River diversion project to protect the Peguis First Nation.

The Peguis First Nation submission provided conditional support for Floodway expansion, but indicated that because the project would affect the Peguis community in a variety of ways, the First Nation would have to be involved in all levels of the Project. In supporting the Floodway, the Peguis First Nation also called for employment to be set aside for members of the Peguis First Nation and further employment be set aside for other interested First Nations.

5.11.2 Lake St. Martin First Nation

A member of Lake St. Martin First Nation described his concerns over the impact of the Portage Diversion of the Assiniboine River into Lake Manitoba. He argued that Lake St. Martin First Nation is flooded by increased water flows coming out of Lake Manitoba as a result of the diversion. These flows, he said, have damaged homes and hay fields.

5.11.3 Tobacco Creek Model Watershed

Several speakers raised the possibility of reducing flooding by increasing water storage capability throughout the Red River Valley. This is at times referred to as the waffle approach, since it creates a waffle pattern when water is stored on fields. One presentation, by the Tobacco Creek Model Watershed (TCMW), spoke of that organization's efforts to reclaim wetland storage areas in southern Manitoba. A series of small dams on the South Tobacco Creek are mimicking natural run-off patterns, with considerable savings to municipalities, which are able to reduce spending on the replacement of roads, culverts, and bridges. As well, farmers benefit from improved supplies of fresh clean water. The TCMW recommended that the MFA set aside a portion of its budget to be used to explore wetland restoration and water storage.

5.12 Conclusion

As can be seen from the above, most of the individuals who appeared expressed reservations about Floodway expansion. Even when they indicated that they believed expansion should go forward, they often stipulated that they wanted to see significant conditions attached to any approval. In some cases, this would require subjecting the project to additional levels of public scrutiny. While the Commission listened to their comments very closely, and has incorporated many of their concerns in the conditions associated with its recommendations, it is nevertheless recommending that the Project be licensed.

Public hearings, by their very nature, are often more likely to attract comments from individuals and organizations with critical perspectives on the project under discussion than from those who will benefit from the project. An expanded Floodway will provide the people of Winnipeg with greatly enhanced Flood protection. The City of Winnipeg made a presentation supporting the Project, as did the head of Civil Engineering at the University of Manitoba (also a former consultant to the MFA). However, no private City of Winnipeg resident appeared before the Committee in an unofficial capacity to support improved flood protection for the City of Winnipeg. The Commission does not interpret this silence as a lack of support for the Project but rather as a sign that, from the perspective of City of Winnipeg residents, the Floodway has performed well and their expectation is that an expanded Floodway will provide greater future benefits. The Commission's recommendations are based, not on the number of presentations it heard, but on the quality of the evidence and arguments that was placed before it.

In the end, the debate over flood-protection policy in Manitoba is not simply a technical debate but a public policy debate about complex issues of equity, fair treatment, mitigation and compensation for flooding. It is an important debate and is likely to be an ongoing one: for this reason, it is important to recognize that all those who appeared before the Commission during this hearing, even when they were only speaking about their personal concern or experience, were serving the public interest.

Chapter 6

Artificial flooding

Most Manitobans have come to understand the Red River Floodway as a success story, and view its role in protecting the City of Winnipeg from the 1997 flood as its greatest achievement. However, some Manitobans who live immediately upstream of the Floodway have a far less sanguine view of the Floodway. They are more likely to associate it with the artificial flooding of their homes and property than with flood protection. Rather than seeing the Floodway and its operation as an example of far-sighted public planning, their experiences have led them to become distrustful of and even hostile to government. Not surprisingly then, artificial flooding and its impact on individuals, families, and communities, was a central issue for many individuals and organizations that appeared before the Panel.

From the outset of the hearing, the Manitoba Floodway Authority (MFA) took the position that because the operating rules were not changing with Floodway expansion (indeed, the MFA stated that the rules were hard and fast), Floodway expansion would have only one impact on artificial flooding; namely to reduce its frequency and severity under almost all conditions.

During spring emergency operations, artificial flooding now commences with 1-in-90-year floods similar to the 1997 flood. With Floodway expansion, it would commence at the 1-in-120-year flood level. Furthermore, with the expansion in place, there would be a reduction in artificial flooding levels as far south as Aubigny for floods with return period of up to 1-in-225 years. Finally, for a 1-in-700-year flood, artificial flooding would extend no further south than the Aubigny region. In short, Floodway expansion would result in artificial flooding that—depending upon the magnitude of the flow—would be equal to or less than artificial flooding levels that would occur with the existing Floodway. For this reason, the MFA determined that, in this area, expansion provided a small but not significant benefit.

The MFA statements about the impact of the expansion of Floodway capacity on artificial flooding are accurate. However, the issue is too complex and important, and the cause of far too much ill-will and anxiety, to simply leave it at that.

This chapter will discuss the Floodway operating rules, artificial flooding, both as the result of spring emergency operations and non-spring emergency operations, and proposed and existing compensation measures.

6.1 The operating rules

The operating rules and their effects are described in detail in Chapters 2 and 3. Rules 1-3 govern spring emergency operations, while Rule 4 governs non-spring emergency operations. Under Rule 1, the Floodway gates will be operated in a manner to hold water levels at or below natural while maintaining Red River levels in Winnipeg at or below 24.5 feet above James Avenue Pumping Station Datum (JAPSD) (229.2 metres above sea level (ASL)). When levels reach 24.5 feet above JAPSD (229.2 metres ASL), Manitoba Water Stewardship invokes Rule 2 and the gates are operated in a fashion to hold the Red River at 24.5 feet above JAPSD (229.2 metres ASL). Rule 2 thus results in artificial flooding upstream of the Floodway gates: the higher the level of flow in the river, the more water the raised gates will hold back and the higher the level of artificial flooding.

Unfortunately, the City of Winnipeg is not yet prepared to accommodate water levels of 24.5 feet above JAPSD (229.2 metres ASL) without considerable flooding of low-lying residences not protected by the primary dykes. This issue is discussed in detail in Chapter 10.

Rule 4 sets out a series of conditions that have to be in place before Manitoba Water Stewardship can consider raising the Floodway gates for emergency non-spring operations. These provisions include a Red River level of 14 feet above JAPSD (226.0 metres ASL) and the forecast of heavy rainstorms. Clearly, the Floodway rules of operation and artificial flooding are intertwined. Because the Commission will be recommending on the licensing of the operation of the Floodway, it must address this issue.

The operating rules are issued under the general authority of *The Water Resources Administration Act*. While the Act does not make any reference to any rules of operation, section 5 of the Act reads as follows:

> The minister may
> (a) construct or operate, or construct and operate, in any part of the province such water control works as he may deem necessary or expedient in the public interest; and
> (b) construct or operate, or construct and operate, any water control works on the request of, and as agent for, any local authority or other authority established by statute.

These provisions are the only legal restrictions on the operating rules. Under the original contract between the governments of Canada and Manitoba for the construction of the Floodway, Manitoba was supposed to supply Canada with a plan of operations for the Floodway. Following a federal request in 1969, Manitoba provided the plan in 1970. The federal government never commented on the original plan of operation, which was subsequently revised by Manitoba in 1984. The 1984 operating rules for the Red River Floodway stated that Rule 2 operations would commence when Red River water levels were at 25.5 feet above JAPSD (229.5 metres ASL). The rules acknowledged that this would raise water levels upstream of the inlet to above natural levels. The rules also indicate that, in severe emergencies, those levels could be raised to 237.1 metres (778.0 feet) ASL.

In approximately 1996, the Manitoba Department of Natural Resources published a leaflet on the Floodway that made statements that contradict the 1984 operating rules. Specifically, the leaflet stated Floodway operations would not aggravate flooding south of Winnipeg. The brochure went on to say, "the Floodway Inlet Control Structure is operated to keep the water level south of the Floodway at, or below, what it would be under natural conditions, that is, below the level that would occur if the Red River Floodway, the Portage Diversion and the Shellmouth Reservoir did not exist." In short, members of the public were advised that Floodway operations would not lead to artificial flooding at a time when the actual operating rules did provide for such flooding in extreme flood situations.

The rules were subsequently changed in the middle of the 1997 flood, when the trigger for moving from Rule 1 to Rule 2 was dropped from 25.5 feet above JAPSD (229.5 metres ASL) to 24.5 feet above JAPSD (229.2 metres ASL) because it was feared that adherence to the 25.5 feet above JAPSD trigger would lead to overtopping of some of the dykes within the City of Winnipeg. This was an emergency decision that was made without public consultation. Its implementation led to 60 centimetres of artificial flooding upstream of the Inlet Control Structure.

Rules 1 to 3 were subsequently reviewed in 1999 by the Red River Floodway Operational Review Committee which included representation from Canada, Manitoba and the rural municipalities of Ritchot, Morris, and MacDonald and approved, by both the governments of Canada and Manitoba in 2000. (The three rural municipalities recorded an objection to the fact that the terms of reference did not permit "an examination and recommendations with respect to compensation for damages caused by the control structure for persons whose properties are upstream.") At that time, the federal environment minister recommended that Manitoba undertake consultations with its citizens on the rules of operation and other measures, as advocated by the International Joint Commission, at the earliest possible opportunity. A 2003 agreement between the governments of Canada and Manitoba gave the Manitoba government sole responsibility for the operating rules.

In the summers of 2002 and 2004, the Floodway was operated to prevent basement flooding, sewer backup, and associated public-health problems such as mould in the City of Winnipeg. These operations took place largely outside the existing rules. However, at the urging of the federal government, the Manitoba government developed a Rule 4, which was communicated to the MFA in the fall of 2004. There was no public involvement in the development of this rule. At the Commission hearing, a Manitoba government representative told the hearing that the reason for this lack of consultation was that Rule 4 simply codified existing practice.

6.1.1 The MFA position

One of the key questions that arose during the hearing revolved around the degree to which the Manitoba government was required to adhere to the rules. Underlying this discussion was a 1997 Manitoba government memorandum to the federal government that described the rules as guidelines and went on to comment "An engineer would be irresponsible to knowingly allow Winnipeg to flood because he rigidly holds to the operating rules." During the hearings, the term the MFA used to describe Rules 1-4 was "hard and fast." Testimony from a representative of Manitoba Water Stewardship indicated that the government would now be more likely to adhere to the rules because they were directly referenced in *The Red River Floodway Act*.

Water Stewardship was of the position that it would take a major disaster within the City of Winnipeg, such as the failure of a dyke, to bring about a situation in which Manitoba would violate the operating rules. In the MFA's final submission, its counsel cautioned that contingencies might arise during emergencies that required changes in the rules without consultation.

6.1.2 Public comment on the rules

Members of the public expressed concern about the limited level of public input into the development and review of the operating rules, noting that the 1999 review did not consult with various resident organizations that had come into existence following the 1997 flood. The Reeve of Ritchot said that when his municipality participated in the 1999 review of the rules, it had been left with the impression the rules would be re-examined as part of Floodway expansion.

The operating rules themselves are not readily available to the public. At the time of the hearing, they were not posted on either the Manitoba government or MFA websites, one upstream resident told the hearing that she had not heard of Rule 4 until it was described by the MFA at the Commission hearing. People expressed considerable mistrust of government and its handling of the operating rules, pointing to the mid-1990s leaflet that indicated that the Floodway operation would not result in artificial flooding and the 1997 decision to change the rules in a manner that, while saving Winnipeg from flooding, increased artificial flooding upstream of the Inlet Control Structure. Some presenters wondered if it would not be possible to place some sanction on government if it violated the operating rules. There was also a concern that community organizations, rather than municipal officials, ought to have representation on any body reviewing the operating rules, since the officials might lack direct knowledge of the issue.

6.1.3 Commission comment

The Commission accepts that the Manitoba government has made a good-faith commitment to adhere to the current operating rules. It also accepts that the 1997 decision to modify those rules was prudent. Nor would it be prudent to restrict the Manitoba government's ability to modify the rules in emergency situations. All of which is recognition that the rules are not and should not be too hard and fast: governments need flexibility when responding to natural disasters. Finally, while *The Red River Floodway Act* prevents individuals from going to court to stop Floodway operations during an extreme flood, this provision only applies if the Floodway is being operated in accordance with the rules or any manner authorized by either an Act or license of the Manitoba legislature.

It is also clear that the public has not always been provided with clear and accurate information about the rules. The rules and their implications should be posted on the websites of the agencies responsible for operating and maintaining the Floodway and carrying out construction of the Floodway expansion. This information should be published in brochures that are distributed in the communities affected by Floodway operations. The information should be clear, accurate, and complete.

More significantly, the operating rules should be subjected to a regular public review. Such a review should take place at least every five years. No new rule should be adopted, as Rule 4 was, without first being submitted to public review. An appropriate body for conducting such a review would be the Red River Floodway Operational Review Committee. As a part of such a review, there should be provision for members of the public to make presentations to the review committee. Except for changes made to the rules under emergency conditions, no rules should be revised without first being submitted to public hearings. Any changes made to existing rules in response to emergency conditions should be submitted for such a public review within a 12-month period.

Given that the last review of the operating rules took place six years ago, it would be appropriate to send the current rules out for review as soon as possible.

Finally, the Floodway should be operated in accordance with the approved operating rules. The events of 1997 make it clear that that the Manitoba government has the authority and capacity to amend those rules quickly in an emergency situation.

Non-licensing recommendation

6.1 The Manitoba Floodway Authority and Manitoba Water Stewardship post the operating rules, along with clear explanations of their implications on their websites. They should also publish this information in brochures to be distributed to residents of communities affected by Floodway operation. The information should be clear, accurate, and complete.

Licensing recommendations

As a condition of a license to operate the Floodway

6.2 Manitoba Water Stewardship operate the Floodway in accordance with the approved operating rules, recognizing the Minister's right to unilaterally adjust the rules in emergency situations.

6.3 Manitoba Water Stewardship conduct public reviews of the operating rules at least once every five years. No new rule shall be adopted without first being submitted to public review. Except for changes made to the rules under emergency conditions, no rules shall be revised without first being submitted to public hearings. Any changes made to the existing rules in response to emergency conditions shall be submitted for such a public review within 12 months of the change.

6.2 Artificial flooding arising from spring emergency operations

Artificial flooding occurs when Floodway operations raise the water level in the Red River above the natural level. The concept of natural refers to the water level that the Red River would be at if, following the 1950 flood, various flood control projects, such as the Floodway, the Portage Diversion, the Shellmouth Dam, various dykes, and bridges had not been constructed. The Commission has a number of concerns with details of current definitions of natural, which it will discuss later in the chapter, but the concept is clear.

There is some uncertainty as to whether the designers of the Floodway contemplated artificial flooding. The original design report for the Floodway makes the following comment in its discussion of design requirements: "the discharge capacity should be sufficient to pass the 1,000 year flood with the Floodway in operation and without causing an increase in upstream water levels over those which would have been obtained under natural conditions with the minimum Assiniboine River contribution." This would appear to suggest that the Floodway was meant to be operated without creating artificial flooding. However, a table in the same design report shows water levels at the inlet at 86 centimetres above natural for a flow of 7,985 m^3/s at the Redwood Bridge and 1.8 metres above natural for a flow of 8,976.4 m^3/s and an inlet structure water level of 237.2 metres ASL. A water level of that height cannot be reached without extensive artificial flooding. On the final day of the hearing, MFA counsel acknowledged that, until 1970, Manitoba government officials may not have fully appreciated that Floodway operations might involve artificial flooding.

During spring emergency operations, artificial flooding should not occur until Rule 2 is invoked. From 1969 to 2004, Rule 2 was invoked on only one occasion—the 1997 flood. At that time, the trigger point for invoking Rule 2 was dropped from 25.5 to 24.5 feet above JAPSD (from 229.5 metres ASL to 229.2 metres ASL). It is now clear that, during that same period, spring emergency Floodway operations raised water levels above the natural level on eight additional occasions. There are two sources for this discrepancy.

First of all, in 1974 and 1979 Manitoba computed the flow in the Red River using an incorrect relationship between gate position and river levels. As a result, the water was raised above the natural level. Manitoba now uses recorded streamflow to determine what level the gates should be set at so as to not exceed natural water levels.

The determination that the level rose above natural on six other occasions was only made in 1999 when, as noted in Chapter 2, the natural rule curve was recomputed. This rating curve was subsequently recalculated by Acres Manitoba Limited in 2004. All the information provided to the Commission during the hearing as to the levels of artificial flooding that communities would experience employed the Acres definition of natural. The new rating curve determines the natural level at the inlet for the 1997 flood to be 234.5 metres ASL, while the Manitoba government original estimate was 234.7 metres ASL. It should be clear that there is no suggestion that Manitoba government deliberately overestimated the natural level. The difference between the calculation of natural in the 1960s and the more recent determination is primarily due to the following:

- The analysis in the 1960s would have been done by hand, using published tables and slide rules. Thus, a limited number of scenarios would have been analyzed.

- In the 1960s study, model calibration was done using data collected solely from the 1950 flood. For the 2004 analysis, data from both the 1950 and the 1966 flood was used and a quality control review of the data was carried out. There are quality control problems with the 1950 data that were not known at the time of the 1960s study.

- The modelling done in the 1960s was based on the then-available topographical information. For the recent study, more detailed topographical information, was used to better define the flooded area.

In the 2004 Acres Manitoba study, topographical and backwater modelling was linked to a geographic information system to allow the graphical visualization of model construction and results. This type of technology was not available at the time of the original study.

On these six occasions when the water levels were raised above the natural level, the operators were maintaining upstream river levels at what they believed to be below the natural level.

Prior to 1997, none of these incidents of artificial flooding led to the flooding of communities or private residences. Because the Manitoba government was using the old calculation of natural in 1997, the government initially took the position that there had been only a slight level of artificial flooding in that year. It was only after the Manitoba Water Commission reviewed the matter that the natural was recomputed and it was concluded that artificial flooding upstream of the Floodway had added 60 centimetres to the water level immediately upstream of the control structure. Again, while there was no suggestion that the government deliberately attempted to mislead the public, the dispute over the amount of artificial flooding contributed to the level of distrust with which some residents viewed the Manitoba government.

At the hearing, the 768 Association, which represents residents in the Turnbull Drive area, noted there is still a measure of uncertainty associated with the calculation of the natural rule curves. This led the organization to recommend that the Manitoba government adjust the natural rating curve to reflect this uncertainty. A Manitoba government representative told the hearing that Water Stewardship was responding to this issue by attempting to hold water levels a little below natural, rather than at the natural level. It should be noted that the natural level that Water Stewardship is committing to operating at is the level that was recomputed by Acres Manitoba Limited. The issue of uncertainty in regard to the natural will be addressed once more in this chapter in relation to compensation under *The Red River Floodway Act*.

The construction of a number of flood prevention structures in the Ritchot area, particularly the Grande Pointe ring dyke and the Seine River diversion, have led to a number of anomalies that are described in sidebar 6.1.

6.2.1 The MFA position

6.2.1.1 Upstream of the Inlet Control Structure

As noted at the outset of this chapter, the

Sidebar 6.1

Flood protection issues east of Highway 59

Two presenters from the area east of Highway 59 and immediately south of the Floodway expressed concern with the new Seine River diversion which runs along the east side of the Highway from the river to the Floodway channel. As a result of a decision to protect Grande Pointe by means of a ring dyke, the construction of a diversion became necessary as a practical solution to preventing Seine River floodwaters from entering the community. The presenters pointed out that water could back up from the Floodway along the diversion, spread out over the prairie and flood them.

The MFA testified that, as a result of Floodway expansion, residents east of Highway 59 would no longer be flooded by a flood the size of 1997 when they had over 1 metre of water around their homes. While floods somewhat larger than 1997 would still flood the area, residents of the area would be better off as a result of Floodway expansion.

The presenters took little solace in this when they had apparently been under the impression that the Grande Pointe dyke (coupled with a proposed diversion of waters to the east of them to enter the Floodway in the vicinity of the Trans-Canada Highway) would provide them the same level of protection as the people in Grande Pointe.

While the Commission sympathizes with the residents of this area, there does not appear to be any practical solution to their situation. As some of the residents may have made a decision not to flood proof based on a misunderstanding that they would be protected from larger floods, perhaps Canada and Manitoba would consider reopening the flood-proofing program for a short while to enable those who wish to flood proof to do so.

MFA took the position that since artificial flooding will not occur until the 1-in-120 year flood as opposed to the 1-in-90-year flood, expansion provided a small but not significant benefit. The MFA addressed the possibility of measures that could be taken to reduce the upstream risks of artificial flooding during spring emergency operations. The Environmental Impact Statement (EIS) supplemental filing stated "Many properties between Ste. Agathe and the Floodway Inlet would likely not be upgradeable to 700 year protection without major modifications, since they lie within the zone of backwater influence of the Inlet Control Structure and would be subject to artificial flooding as a result of Floodway Operation in response to the extreme event." However, at the hearing, the MFA addressed the issue of using temporary dykes to improve the flood protection levels in areas threatened by artificial flooding in extreme flood events. An MFA representative stated that, in a 1-in-225-year flood, sandbags and earth could be used to build temporary dykes to protect communities and residences. In the case of a 1-in-700-year flood, communities and residences would have to raise temporary dykes by approximately 2.0 metres. The representative then referred to a recent University of Manitoba study that determined that a 2.0 metre sandbag dyke was a safe temporary measure.

6.2.1.2 Downstream of the Outlet Structure

The MFA has taken the position that, with Floodway expansion, the water levels downstream of the outlet would not rise above natural because of the downstream benefit of the Portage Diversion and the Shellmouth Dam. Presenters from downstream of the Floodway Outlet Structure pointed out that, in the 1826 flood, it is now believed that the Red River broke out of its banks downstream of the Redwood Bridge and a portion of the flow traveled west and north along a route to Lake Winnipeg including Oak Hammock Marsh, bypassing the Selkirk area. These presenters contended that the capacity of the river channel downstream of the Floodway outlet was insufficient to carry the full flow of the river in a 1-in-700-year flood. Their position could also lay the basis for an argument that, in extreme flood conditions, the upstream natural level needs to be recomputed. However, modelling done by Water Stewardship concluded that, for the 1-in-700-year flood, river levels for the expanded Floodway would be about 15 centimetres lower than natural at Breezy Point, and 32 centimetres lower at Selkirk. These results suggest that, even in the most extreme condition, the Floodway would not create artificial flooding north of the Floodway.

6.2.2 Public comment on spring emergency operations

As noted in Chapter 5, presentations from residents and organization upstream of the Floodway focused considerable critical commentary on the issue of artificial flooding. Some said that artificial flooding had not been contemplated as a part of the original Floodway operation. Others wanted to know under what authority the Manitoba government could flood their land. They wanted the practice banned and if that was not done, they wanted a program of easements and buyouts to reflect the increase in their risk. Other residents wondered whether it was not possible to reduce artificial flooding by removing the lip at the Floodway entrance, thus allowing more water to enter the Floodway sooner. If this were done, it was thought that the Floodway could be operated in a manner that, in smaller floods, could keep water levels upstream of the Floodway below natural. This would provide upstream residents with a greater benefit from the operation of the Floodway. They also said flood-proofing measures taken under the Red River Valley Flood Proofing and Dike Enhancement Agreement had scarred their communities, leaving in its wake numerous deep pits and ponds from which soil had been removed to build dykes and pads on which houses had been relocated.

In response to assurances that their concerns would be met by the provisions of *The Red River Floodway Act*, residents expressed ongoing suspicions over the accuracy and timeliness of the calculation as to whether artificial flooding occurred and if so, to what extent and who would determine this.

6.2.3 Commission comment on spring emergency operations

As noted in the commentary on the operating rules, public communication on the issue of artificial flooding has been very poor. The recomputation of natural levels and the discovery that Floodway operations have raised water levels above natural on nine occasions during spring emergency operations has further undermined the relationship between upstream residents and government.

While there is a measure of ambiguity about whether or not artificial flooding was contemplated by the original designers of the Floodway, (at least for floods up to the 1-in-1,000-year level), it is clearly the case that artificial flooding is permitted under the current operating rules. As noted below, *The Red River Floodway Act* will provide the government with the authority to flood lands and store water during spring emergency operations. Without Floodway expansion, spring emergency operations would continue under the current rules: artificial flooding would occur more frequently and with a greater impact.

Many residents south of the Floodway believe that the weir or lip located at the entrance to the Floodway restricts the flow of water into the Floodway and thus increases artificial flooding. This weir serves two purposes. It prevents large volumes of ice from entering the Floodway during the spring. If ice entered the Floodway Channel it could create ice jams at the bridges over the Floodway and reduce the Floodway's effectiveness. The weir also keeps water out of the Floodway Channel in the summer. This protects the vegetation along that Floodway Channel which is intended to prevent erosion of the Channel.

Removing the lip at the entrance or replacing it with an inlet structure, would reduce the river level at the Floodway Inlet by only approximately 35 centimetres. The largest increase in flow into the Floodway would occur at approximately 228.6 metres ASL. At that level the Red River is well within its channel. As water levels near the top of the riverbank, the lip does not serve as a barrier to flow into the Floodway, and there would be no additional benefit to upstream residents. For these reasons, the Commission is not recommending any changes to the lip.

As noted above, the flood protection measures undertaken since 1997 have, at times, had a negative impact on the landscape upstream of the Floodway. In some cases, people have been left with large, unattractive, and potentially dangerous pits on their land. To address the impact that previous flood-proofing programs have had on the aesthetics of the Red River Valley clean fill from the expanded Floodway excavation should be supplied, transported, and placed free of charge to residents south of Floodway for backfilling of holes resulting from construction of mounds and dykes for flood proofing.

The MFA indicated that, with additional sandbagging and other temporary flood-proofing measures, the level of flood protection available to residents in the zone that is threatened by artificial flooding could be protected up to the 1-in-700 year level. Given the fact that the operation of the Floodway is responsible for any artificial flooding, the operators of the Floodway have a responsibility to supply those temporary measures.

The Commission is not issuing licensing requirements that forbid raising water levels above natural in spring emergency conditions. In doing so, it recognizes that a flood-protection system that increases flood risks for some individuals under some situations must be balanced with a robust, proactive and equitable compensation system. The Commission will comment on this issue in subsequent sections of this chapter.

Non-licensing recommendations

6.4 The MFA supply, transport, and place, free of charge, clean fill from the expanded Floodway excavation during construction to residents south of Floodway for backfilling of holes resulting from construction of mounds and dykes for flood proofing.

Licensing recommendations

As a condition of the license to operate the Floodway

6.5 Manitoba Water Stewardship be responsible for paying for and physically assisting the Rural Municipalities in the timely supply, delivery, and removal of sandbags to residents, farmsteads, and business structures that are at risk from artificial flooding.

6.3 Non-spring emergency operations

Non-spring emergency operations is the term that the MFA used to describe Floodway operations intended to prevent basement flooding, sewer back-up, and related public-health problems in the City of Winnipeg. Since these problems are the result of high water levels associated with summer and fall rainstorms as opposed to spring run-off, these operations have been designated non-spring operations. Because the Shellmouth Dam and the Portage Diversion are usually not providing any reduction of Red River water levels in the summer and fall, any Floodway operation that raises the upstream water level during this period will almost always result in artificial flooding.

The Floodway was not originally intended to be used to address non-spring emergencies. The introduction of such operations for the first time in 2002 on an *ad hoc* basis represented a significant policy shift. In the summer of 1993, Manitoba Water Resources resisted a proposal that the Floodway be operated to prevent basement flooding and sewer backup. The basement flooding that occurred that summer resulted in $140-million of property damage. According to the MFA, $100-million of that damage was related to river water levels. After that flood event, in the mid-1990s, Manitoba Natural Resources published a brochure that stated "basement flooding would not be prevented by using the Floodway because such flooding is mostly due to runoff from extreme rainfall events exceeding the carrying capacity of the sewer pipes." The same brochure also stated that the Floodway operating rules prohibited using the Floodway to prevent summer flooding problems in Winnipeg.

In July 2002, heavy rainfalls caused the Red River to rise to14 feet above JAPSD (226.0 metres ASL). This led the Manitoba government to authorize the use of the Floodway. On July 5, the day the river rose to 15.5 feet above JAPSD (226.3 metres ASL), the Floodway gates were operated and the river level within the City dropped 1.1 metres in 24 hours. The upstream water level reached 230.1 metres ASL, meaning it was 6.4 metres above normal and 1.5 metres above natural. (Normal being 223.7 metres ASL and natural 228.5 metres ASL.) The operations flooded up to 405 hectares and the gates remained up until August 4, 2002, a period of slightly more than four weeks.

In 2004, the gates were operated between June 10 and July 27, for approximately seven weeks. On June 10, the gates were operated and the water levels in Winnipeg dropped from 15.3 feet above JAPSD (226.4 metres ASL) to 9 feet above JAPSD (224.5 metres ASL) in 30 hours. The water level upstream of the inlet structure rose to 4.9 metres above normal and 2.4 metres above natural. The water levels were reduced by 0.15 metres a day in order to reduce potential impact on riverbank stability. In both cases, while residences were not flooded, market gardens and other agricultural land were flooded. According to the MFA, compensation was made available to local governments, individuals, farm, and market garden operations.

Following the 2004 operation, the Manitoba government, at the urging of the federal government, developed Rule 4 and communicated it to the MFA in November 2004. The Rule specifies that:

> There will be no operation of the Floodway as long as there is a prediction that levels will remain below 14 feet James during the next ten days.
>
> If the water level is expected to rise to 14 feet James or higher in the coming ten day period, Water Stewardship will prepare a report that describes the river level forecasts, and the risk of basement flooding in Winnipeg. That risk assessment must include the predicted peak, the length of

> time the Water Stewardship expects the river to be at 14 feet James or higher, and the risk of intense rainfall in the coming ten day period.

Under this rule, the gates can be operated to reduce the water levels to 9 feet above JAPSD (224.5 metres ASL). At the same time, the water level upstream of the inlet structure is not to be raised to more than 231.7 metres ASL (about 4.9 metres above normal summer level). Except in cases of extreme urgency, the river levels are to be lowered by no more than 30 centimetres per day. The MFA states that the desirable rate of lowering the river levels is by 15 centimetres a day, which would mean that it would take ten days to reach the level of 2.7 metres (9 feet), which would still be 30 centimetres above the walkways at the Forks. The 231.7 metres ASL upstream elevation is slightly higher than the levels reached in 2002 and 2004, although the MFA states that it would maintain the water below the top of the riverbank (except, obviously in low-lying areas).

According to the MFA, when the Red River is at 14 feet above JAPSD (226.0 metres ASL), 32,887 houses in Winnipeg are at risk of basement flooding and sewer backup should a significant rainstorm take place.

The final point in Rule 4 states "The Department will maintain a program of compensation for damages suffered by landowners from flooding caused by Floodway operation under this rule." During the hearings, the MFA described this program as being at the midpoint between being a strictly *ad hoc* program and a formal program. The MFA also stated that the Manitoba Emergency Measures Organization (EMO) would "institute the compensation in the same manner that they have in the two previous events."

6.3.1 The MFA position

During the hearing, the MFA was asked on how many past occasions the preconditions for the invoking of Rule 4 had been attained. The answer provided was that the preconditions for invoking Rule 4 have occurred in 16 of the last 36 years.

In its supplemental filing, the MFA stated that there are unresolved issues and concerns related to what it termed summer operations (or non-spring emergency operations). The filing stated that the MFA and Manitoba Water Stewardship intended on undertaking investigations into riverbank stability, fish passage, and wildlife along the riverbank channel in relation to non-spring operations.

6.3.2 Public comment on non-spring emergency operations

No upstream resident spoke in favour of non-spring emergency operations. They felt it had been imposed on them without consultation, assessment of its impact, or an appropriate compensation and mitigation plan being in place. One speaker pointed out that it appeared that Rule 4 had been developed in the absence of any analysis of the frequency of summer flooding. Presenters questioned whether appropriate assessments had been carried out into the long-term impacts of such operations. It was felt by many that non-spring emergency operations could erode dykes and riverbanks that are less susceptible to these problems in the spring when they are frozen. Several presenters said that the 2002 and 2004 summer operations had led to riverbank collapses and the death of riverbank trees and vegetation, which will further weaken riverbanks. Concerns were also expressed about the impact of non-spring emergency operations on wildlife. They also expressed dissatisfaction with the compensation program, noting that they were not compensated for loss of enjoyment of their property when it was submerged under water for weeks.

It should be noted that few upstream residents had adopted the term non-spring emergency operations. They viewed it as summer operation of the Floodway, and many believed that this was the first step towards operating the Floodway in summer to keep the City of Winnipeg riverwalks above water. The prospect that non-spring operations, which result in artificial flooding, could occur every two years served to intensify hostility towards non-spring emergency operations. As in the case of spring emergency use, residents also questioned whether it might not be possible to alter the Floodway inlet to reduce artificial flooding levels during non-spring emergency operations. A number requested that the non-spring emergency operations be banned; failing that, they requested a variety of forms of financial mitigation including buyouts and easements.

The MFA maintained that summer operation of the Floodway to lower water levels on the Red River to ensure that the walkways in downtown Winnipeg remain above water, was not within the scope of these hearings and pointed out that Rule 4 prohibited such use of the Floodway. Furthermore, both MFA and Manitoba Water Stewardship representatives made a commitment that before a rule authorizing such a use could be adopted, the Manitoba government would seek appropriate environmental approvals including a licence variation. Residents, who in the past had been told that the operating rules prohibited use of the Floodway to prevent basement flooding, were not assuaged by these assurances.

6.3.3 Commission comment

The MFA is correct in noting that non-spring emergency operations have taken place and could continue to take place without Floodway expansion. Any reservations that the Commission has with Rule 4 do not stand in the way of the Commission's decision to recommend the licensing of the construction of Floodway expansion. The Commission has the following observations to make about non-spring operations:

- In 2002 and 2004, the Floodway was operated in a manner that was not in accordance with the existing operating rules, nor was there any advance consultation with the individuals who would be affected by the flooding caused by this operation.
- The 2002 and 2004 operations took place in the absence of a formal compensation program.
- Rule 4 was adopted without public consultation.

During the hearing, a Manitoba Water Stewardship representative stated that because of the cost associated with disrupting construction, there was virtually no possibility of operating the Floodway to prevent sewer backup during the construction period. Manitoba should make use of this period of time to make sure that all unresolved issues relating to Rule 4 are addressed and the rule has been subjected to a public review before it needs to be invoked. Furthermore, the Manitoba government should ensure that the MFA and Manitoba Water Stewardship complete the various studies that they have committed to regarding riverbanks, fish passage, and wildlife.

At the request of the Commission, consultants to the MFA carried out a cursory study of the cost of reducing artificial flooding during non-spring emergency operation. They indicated that to achieve a small reduction in artificial flooding of about 40 centimetres as a result of removal of the entrance lip would require construction of a structure to replace the lip and deepening of the Floodway Channel from the inlet to the Trans-Canada Highway. This deepening would also likely result in a need to modify the Seine River syphon. The total cost for these modifications would be in the range of $14-million with benefits in the range of $3-million. There would still be artificial flooding of some 2.2 metres under this scenario. Thus, the MFA consultants concluded, there was not much merit in considering such an exercise. This is a conclusion with which the Commission concurs.

6.4 Compensation

It should be noted that many people who had been affected by artificial flooding indicated that they believed it was appropriate to have adjusted the rules in 1997 to prevent flooding in Winnipeg. They recognized that the magnitude of the disaster that would have arisen if there had been widespread flooding in Winnipeg. However, they also believed that social equity demanded that they be fairly compensated for having been, in their opinion, sacrificed for the City. One cannot countenance artificial flooding in the absence of fair, effective, and complete compensation provisions.

As noted in Chapter 4, Floodway expansion has been accompanied by the introduction of three separate compensation schemes:

- *The Red River Floodway Act.*
- Compensation related to non-spring emergency operation of the Floodway.
- The MFA's proposed compensation for flooding downstream of the Floodway outlet.

In addition, Manitoba flood victims can claim assistance from the Disaster Financial Assistance (DFA) program. The DFA is an existing, well-detailed program, intended to provide assistance following natural disasters. It is not, however, an appropriate program for providing compensation following flooding that is the result of deliberate government policy.

6.4.1 *The Red River Floodway Act*

The Red River Floodway Act was adopted by the Manitoba legislature in 2004. However, its regulations have not been released nor has the legislation been proclaimed. The Act's purpose is to restore claimants to their former, pre-flood financial position if they have suffered property damage or economic loss as a result of the Floodway raising water levels above the natural level during spring emergency operations. Individuals, farms, and business, non-profit organizations, and local authorities can make claims under the Act. Unlike the DFA, which restricts the types of property damage for which assistance may be provided to an approved list of necessities, the Act states that all property damage related to artificial flooding and economic loss such as foregone income would be eligible for compensation. There would be no ceiling on claims and no requirement that claimants pay a portion of the repair or replacement cost. The Act allows for payment of claims on proof of loss, meaning that claimants do not have to make expenditures in order to make a claim.

The Act stipulates that to qualify for compensation, damaged property must meet the criteria for flood proofing in the Designated Flood Area Regulation. Properties that were flood proofed as a part of the Red River Valley Flood Proofing and Dike Enhancement Agreement following the 1997 flood meet this requirement. There is provision for the issuance of orders that specifically exempt buildings or structures and items stored in them from the provisions of the Act. Compensation can also be denied if a claimant's acts or failure to act allowed the damage or loss to occur or contributed to its occurrence. Individuals can make application for compensation under *The Red River Floodway Act* and to any government of Canada, Manitoba or local program such as DFA or crop insurance. However, any benefits awarded by these programs shall be deducted from the benefit awarded under the Act. Furthermore, a person may choose to claim compensation under the Act or commence court proceedings to recover damages for losses caused by artificial flooding, but the Act prohibits a person from pursuing both courses of action. EMO would administer compensation under the Act and the Disaster Assistance Appeal Board would review disputed claims. The Board's decisions can be appealed, on matters of law, to the Court of Appeal, with leave granted by a judge of that court.

In the event of an extreme spring flood or the risk of such a flood, the Act provides the Manitoba government with the authority to flood real property and store water on land and to cause real and personal property to be negatively affected by flooding and water storage. The Manitoba government is also given the authority to issue an extreme flood declaration. When such a declaration has been issued, no one can commence or continue a court action to prevent or restrain the Manitoba government from flooding real property, storing water on land, or causing real and property damage through such flooding. Nor can they commence or continue court actions intended to stop the operation of the Floodway in accordance with the operating rules or in any manner authorized by either an Act or license of the Manitoba legislature. A report on artificial flooding will be made available by early summer each year that the Floodway is operating to control spring flooding.

6.4.1.1 Public comment on *The Red River Floodway Act*

People who made presentations at the hearing had a number of concerns about *The Red River Floodway Act*. In particular, they expressed concern that:

- Claims would be assessed in a manner that tried to determine whether portions of the damage to their property were caused by natural or artificial flooding.
- EMO lacked the resources to implement this program.
- Appeals would be heard by a board that was appointed by the Manitoba government and was therefore not independent.
- The bar on most appeals to the courts meant their claims would not be reviewed by an independent third party.
- Uncertainty was created by the fact regulations had yet to be published.

In the eyes of many presenters, the fact that the government would determine if artificial flooding had occurred, would determine the extent of damage, would determine the level of compensation, and would appoint the appeal panel, rendered the Act suspect. Many people who live in areas at risk of artificial flooding indicated that they believed that compensation should not be imposed by legislation, but should be negotiated through the purchase of easements or buyouts. One organization noted that while the RRFA does deal with compensation for economic damage and loss, it does not address the increased annual risk of flooding experienced by residents upstream of the Floodway. Their presentation recommended that easements be obtained as compensation for increased flood risk. To ensure that future owners of the property receive the benefit of the easement, they recommended that the easement take the form of an annual payment similar in nature to a property-tax credit. The easements could vary in value depending on the increased levels of risk. They recommended that a public process be established and mandated to review and recommend on flood-related compensation issues. They further recommended that the compensation system that arises from this review be made retroactive to the 1997 flood. Finally, they called on Canada and Manitoba to refund the 25 per cent that victims of artificial flooding were required to pay to participate in the post-1998 flood-proofing program.

6.4.1.2 Commission comment

The Red River Floodway Act is a belated but positive piece of legislation. Many of the criticisms that have been directed towards the Act, arise not from its shortcomings, but from the level of distrust that exists between upstream residents and the government. The Act does bar individuals who file claims under the Act from also pursuing their claim through the courts. However, individuals have the option to choose to seek compensation through the courts rather than by applying for compensation under the Act.

The Commission also believes the Disaster Assistance Appeal Board is an appropriate body to hear appeals under this Act. It notes that currently the Manitoba government has the authority to appoint civil servants to the Disaster Assistance Appeal Board. Given the fact that the Manitoba government will be responsible for any artificial flooding, it is the Commission's opinion that it is not appropriate that civil servants serve on panels hearing appeals under the Act.

No matter how well-designed and managed, it is doubtful that it will be possible to remove all stress or conflict from the administration of the Act. Other public-insurance agencies such as the Workers Compensation Board (WCB) and the Manitoba Public Insurance Corporation (MPIC) have addressed these issues by establishing an advocate's office to guide claimants in their appeals. Given the infrequency of major flooding, it would not be appropriate to have a full-time advocate office to assist with claimants under *The Red River Floodway Act*. Staff from the WCB and MPIC advocacy programs should be seconded to EMO in the event of a flood that is accompanied by artificial flooding.

A trained complement of damage appraisers who can relate to and work with residents whose homes have been flooded is required after a flood. In addition to damage appraisers, experienced financial advisors, engineers, and health-care professionals are also necessary to assist residents in returning to their normal state.

The Commission also notes that at the time of the hearing the regulations for this Act had not been published. It would be appropriate that these regulations be submitted to a public review.

The provision that allows claimants to make claims under both *The Red River Floodway Act* and other federal, provincial and local compensation programs, raised a number of concerns for residents. Artificial flooding caused by spring emergency operations also involves natural flooding. The concern that people expressed was that they would be obliged to seek compensation for the natural flooding under the far less generous DFA and for artificial flooding under *The Red River Floodway Act*. They feared that they would then end up in conflicts with claims adjustors as to how much flood damage was caused by natural flooding and how much by artificial flooding. The image arose of having damages caused by the first six feet of flooding compensated under the DFA and the last two feet under *The Red River Floodway Act*. Such an approach cannot be justified: if it were employed it would lead to endless conflict and unfairness. Once it has been determined that artificial flooding is a factor, the provisions of *The Red River Floodway Act* should apply to all damages. The Commission assumes that the intent of the provision is to ensure claimants are not compensated for the same damage from different programs. The Act's provisions should be interpreted in this fashion.

The provisions of *The Red River Floodway Act* apply whenever Red River levels rise above natural as a result of the operation of the Floodway. There is, however, as noted above, a measure of uncertainty in regard to the natural. The Manitoba government intention to operate the Floodway slightly below natural is positive, but it does not addresses the question that this uncertainty raises for determining if the operation had created artificial flooding, thereby triggering the provisions of *The Red River Floodway Act*. The Commission will be recommending that in determining whether Floodway operations have led to artificial flooding, the Manitoba government factor the existing degree of uncertainty into its calculation or operate the Floodway in such a manner that results in the reasonable benefit of the doubt being given to upstream residents.

The Commission also has concerns with the definition of natural in *The Red River Floodway Act*. The Act states that natural is the "level that would be expected in the Red River at a given time during spring flooding in the absence of the floodway, the Assiniboine River Diversion, the Assiniboine River dykes, the Shellmouth Dam, the primary dykes in the City of Winnipeg, and urban development in the area protected by the floodway since its design was finalized." The final phrase, "urban development in the area protected by the floodway since its design was finalized," is meant to exclude more recently constructed bridges, mainly in the City of Winnipeg, whose piers and abutments would have the effect of raising the water level and creating a backwater effect. Excluding them gives a lower definition of natural. Unfortunately, the Act is not as clear as it could be in defining which bridges are to be included and which are not, because instead of identifying inclusion or exclusion with a specific date, it states that those developments built after the Floodway design was finalized shall be excluded. This gives rise to two problems. In the first place, the date of finalization of design is too vague a definition. Government officials told the Commission that they believed that the design was finalized in 1963. However, it does not appear that there is any official document that clearly states when design was finalized. If Manitobans are lucky, it could be many decades before Manitobans need to make claims under this Act. By that time it may be difficult to determine the date of the finalization of the Floodway—during the course of the hearing, for example, the Commission learned that some Floodway design documents had been destroyed by fire.

The Commission's second concern is more serious. If the date of finalization of design is, indeed, 1963, then the Act's definition of natural would not exclude the effect of the South Perimeter Highway bridge over the Red River. Depending on the rate of flow in the river, this bridge can raise upstream water levels by several inches. All previous definitions of the natural level have excluded the effect of this bridge, including the one that was done by Acres Manitoba Limited for the Manitoba government in 2004. Currently, the Manitoba government operates the Floodway on the basis of the Acres definition of natural. However, the Commission is concerned that, once *The Red River Floodway Act* comes into effect, the government will be obliged to operate on the basis of a new and potentially higher definition of natural and to compensate on the basis of such a definition. There was never any testimony at the hearing to suggest that this was the government's deliberate intent. However, vagueness in the Act may have that result. For this reason, the Commission urges the government to take all appropriate steps to ensure that the legal definition of natural in *The Red River Floodway Act* conforms with the definition that was used by Acres Manitoba Limited in defining natural in 2004.

The Manitoba government is required to prepare a flood report every time that the Floodway is operated in response to spring emergency conditions. Given the fact that this report will be the basis on which a determination is made as to whether or not artificial flooding took place, it is appropriate that there be a third-party review of this report.

The provision that requires property meet the flood proofing criteria in the Designated Flood Area Regulation means that property owners who did not take advantage of the Red River Valley Flood Proofing and Dike Enhancement Agreement would not qualify for compensation if they were flooded as the result of artificial flooding. While there are only a small number of property owners who have not taken advantage of the program, the existence of these properties may lead to conflict at a future date, particularly since the owners declined the participate in the flood-proofing program prior to the adoption of *The Red River Floodway Act*. For these reasons, it may be prudent to re-open the program for a brief period.

Non-licensing recommendations

6.6 The Manitoba government ensure that no civil servant sit on Disaster Assistance Appeal Board panels hearing appeals under *The Red River Floodway Act*.

6.7 In the event of a flood that is accompanied by artificial flooding, staff from the Workers Compensation Board and Manitoba Public Insurance Corporation advocacy programs be seconded to the Manitoba Emergency Measure Organization to assist claimants in their appeals to the Disaster Assistance Appeal Board.

6.8 Once drafted, *The Red River Floodway Act* regulations be submitted to public review.

6.9 The Manitoba government either:

- factor the existing degree of uncertainty into its calculation in determining whether Floodway operations have led to artificial flooding in a manner that provides claimants under *The Red River Floodway Act* with the reasonable benefit of the doubt; or
- operate the Floodway in such a manner that results in the reasonable benefit of the doubt being given to upstream residents.

6.10 The Manitoba government take all appropriate steps to ensure that the definition of natural in *The Red River Floodway Act* conforms with the definition that was used by Acres Manitoba Limited in defining natural in 2004.

Licensing recommendation

As a condition of a license to operate the Floodway

6.11 Manitoba Water Stewardship, in each year in which there is a possibility that artificial flooding may have occurred, be required to have an independent third-party conduct a peer review of the report that must be prepared for the minister following any spring emergency operation of the Floodway. This review should be carried out within two weeks of the submission of the report.

6.4.2 Compensation related to non-spring emergency use of the Floodway

Rule 4, which authorizes non-spring emergency use of the Floodway, stipulates that "The Department will maintain a program of compensation for damages suffered by landowners from flooding caused by Floodway operation under this rule." The rule contains no other information as to how this program of compensation shall be operated. As noted above, EMO will administer the program—which has yet to be formally detailed. As an alternative to compensation, Manitoba Water Stewardship has sought approval from the Manitoba Treasury Board to purchase low-lying market garden lands upstream of the Inlet Control Structure. The MFA stated that some of the property owners have asked to be bought out. Several presenters expressed dissatisfaction with the disposition of their claims for compensation for damages caused by non-spring emergency operations. As in the case of spring emergency flooding, many residents expressed a preference for buy-outs and easements if non-spring emergency use was to be permitted.

6.4.2.1 Commission comment

The brief provision on compensation for non-spring emergency operation, lacking in all detail, is an example of the way that the planning and development of compensation provisions has trailed behind other elements of Floodway expansion and operations. Non-spring emergency operations could quickly become the most frequent cause of artificial flooding. It will be impossible to develop any level of trust between the Manitoba government and upstream residents as long as the Manitoba government simply asserts the right to flood and store water on people's lands during non-spring operations without a formal compensation system.

Several presenters called on the government to either buy the properties that will be affected by non-spring emergency operations or to negotiate easements with the owners. An easement is simply a right granted by one property owner to another to use a part of his or her land for a specific purpose. A flood easement usually involves a private property owner or a community and a government agency entering into an agreement that allows the government to flood certain lands. The government pays for this right and can also gain the right to restrict the types of development that take place on this land. Easements could be negotiated for the right to flood and store water on land.

A Manitoba government representative testified that the government preferred to provide full compensation, as under *The Red River Floodway Act* when it was dealing with relatively rare events. Given the choice between easements and outright purchases of land, the representative said, while the government preferred easements to outright land purchases, it had problems with easements because people tend to lose track of them when land is sold. He did say however that if the province were to move to non-emergency summer operations—which might happen as often as every two years—it would probably be necessary to make use of easements.

Non-emergency spring operations took place in 2002 and 2004, and the conditions for invoking these operations were in place in 16 of the last 36 years, or nearly once every two years. The Manitoba government should consider entering into easement agreements or buyouts with Manitobans who can expect to have their land flooded, or be under threat of being flooded by government policy with this sort of regularity.

In the same spirit, there must be an established public program in place to compensate individuals, businesses, and organizations who suffer damage as a result of artificial flooding caused by non-spring emergency operations. This program should also be consistent with the provisions of *The Red River Floodway Act*.

Licensing recommendation

As a condition of a license to operate the Floodway

6.12 Manitoba Water Stewardship ensure that individuals, businesses, and organizations affected by artificial flooding created by non-spring emergency operations be eligible for compensation on the same basis as claimants under *The Red River Floodway Act*.

6.4.3 The MFA's proposed compensation for flooding downstream of the Floodway Outlet

While Floodway expansion is not expected to lead to artificial flooding downstream of the Floodway outlet, even during the 1-in-700-year flood, it will under certain conditions, lead to water levels that are higher than currently experienced downstream of the outlet. The EIS proposed the provision of temporary flood-control measures and states that "to the extent that flood mitigation was not fully effective during a flood event, [the Manitoba Floodway Authority] is committed to ensuring that flood compensation be provided to those adversely affected by incremental flooding caused by the project." When the MFA was asked if this compensation would be provided on the same basis as compensation under *The Red River Floodway Act*, it responded that it was not possible to answer the question because the details of the compensation package had not been worked out. Some presenters called for voluntary buyouts for residents downstream of the Floodway Outlet Structure.

6.4.3.1 Commission comment

Again compensation planning lags behind other Floodway planning issues. The MFA must issue a detailed compensation plan that includes who is to operate and fund the plan, what forms of damages are covered, whether there are deductibles, and what form of appeal mechanism will be in place. This plan must then be circulated for public comment.

Non-licensing ecommendation

6.13 The Manitoba Floodway Authority develop a detailed plan for flood compensation downstream of the Floodway Outlet and circulate that plan for public discussion.

6.5 Concluding observations

Since the Red River Floodway went into operation 36 years ago, there have been significant changes in our understanding of the level of flood risk in the Red River Valley. For example, floods that were once thought to return every 160 years are now calculated to be likely to return every 90 years. Urban development patterns in the City of Winnipeg have increased the possibility of summer and fall basement flooding and associated public-health risks. Similarly, our understanding of the natural water level has changed. It took the 1997 flood to give engineers a true sense of the capacity of Winnipeg's dyking system and the current Floodway.

In response, there have been incremental changes to the operation and operating rules for the Manitoba Floodway. It is now expected to deal with extreme floods more frequently and at different times of the year. Floodway engineers and operators have done an admirable job of responding to these new demands. However, these incremental changes have also cast light on the fact that for reasons that were not presented to the hearing—and may not be recorded—insufficient attention was paid to the possible social and economic upstream impacts of the Floodway when it was first constructed. *The Red River Floodway Act* was not adopted to address a new problem—indeed, with Floodway expansion, artificial flooding, at least in the spring, would be a relatively uncommon phenomenon.

There have been a number of compensation-related questions that were put forward during these hearings that were clearly beyond the responsibility of the Commission. The hearing was not, for example, an inquiry into the fairness of the 1997 compensation system or the subsequent flood-proofing program and its requirement for owner contributions. Similarly, the issues relating to whether and how residents might be compensated for the increased risk—as opposed to damages—related to artificial flooding caused by spring emergency operations is beyond the Commission's mandate. The Commission does recognize, however, that the government has an obligation to address the sources of ill-will between it and residents upstream of the Floodway. Second, while the Commission is uncertain that residents have a claim for some additional form of compensation, it recognizes that they have presented arguments that should be addressed in an appropriate forum.

Chapter 7
Groundwater concerns

7.1 Background

Prior to and during the hearing, the rural municipalities of Springfield, East St. Paul, and St. Clements, their consultants, and numerous other participants and presenters expressed concern over the potential for groundwater contamination and the potential of increased loss of valuable groundwater as a result of Floodway expansion. As noted in Chapter 2, the Floodway region contains two aquifers that these municipalities use to meet the growing regional demand for domestic water. The largest aquifer is the confined aquifer located in the carbonate bedrock (Figure 7-1). This aquifer supports private, municipal, industrial, and irrigation wells and supplies water to 40,000 residents. The Birds Hill sand-and-gravel aquifer supplies domestic water for another 3,000 people, as well as meeting agricultural and commercial demands (Figure 7-2). On the east side of the Red River, groundwater flows through these aquifers from east to west. Both of these aquifers lose water to the Floodway. The construction of the existing Floodway Channel cut through the sand-and-gravel aquifer, intercepting its flow, leading to groundwater loss. In the more northerly two-thirds of the Channel, where the layer of the till between the Floodway and the carbonate bedrock can be as little as 1-2 metres thick, water pressure from the carbonate bedrock aquifer creates small springs in the Low Flow Channel through which water from the aquifer escapes into the Floodway. The groundwater loss to the Floodway channel is estimated at 4-million cubic metres per year (11,000,000 litres per day or 127 litres per second)—enough water to service about 31,000 residents at 350 litres per-day per-person. This withdrawal is sufficient to make the Floodway the largest groundwater consumer in the region.

While loss of groundwater to the Floodway Channel is the most serious existing groundwater problem, there is a potential that this flow could be reversed during a flood with contaminated surface water infiltrating the aquifers. This could have serious health implications in both the long and short terms. There are four important variables that need to be taken into consideration when considering potential for groundwater contamination: water quality, potential pathways, hydraulic gradient (the water pressure differential between water in the Floodway Channel and in the aquifer), and the different modes of Floodway operation.

7.1.1 Water quality

Contaminated water can enter the Floodway from many sources. Perhaps, the most obvious source is the water that is diverted from the Red River during a flood situation. However, other sources include water that is diverted from the Seine River into the Floodway Channel, water from agricultural and urban drains, and natural runoff. These sources are essentially beyond the control of the Manitoba Floodway Authority (MFA). The MFA has taken the position that the water in the Floodway Channel is not potable and has to be prevented from infiltrating into the groundwater supply. It is important not to view the Red River as the only potential source of contaminated water. As sidebar 7-1 makes clear, all of the sources of inflow in the Floodway are potential sources of contamination. If contaminants enter the fractured bedrock aquifer, they could travel relatively long distances relatively quickly and present a threat to water quality.

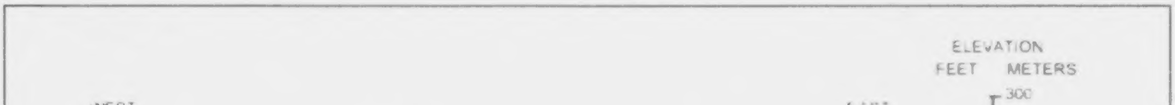
7.1.2 Pathways

There needs to be a route by which the water in the Floodway Channel can reach the aquifers before any contamination can take place. The clay, silt, and till overlay should create a barrier between the Floodway Channel and the aquifers. For the most southerly third of the Floodway, a substantive layer of brown (weathered) and grey clay beneath the Floodway Channel provides little opportunity for infiltration of contaminants to groundwater. The hydraulic conductivity of the grey clay is low and the duration of any infiltration during a flood event is so short that there is virtually no risk of contamination of groundwater over this part of the Floodway.

However, a thinner layer of low permeability soil beneath the northerly two-thirds of the channel offers less protection. At times, the channel bottom comes close to the bedrock itself. This is one of the areas of greatest risk of groundwater contamination. A second area is where the Floodway Channel intersects the sand-and-gravel deposit of the Birds Hill aquifer. Before continuing with this discussion it should be emphasized that these are only potential pathways. They have existed ever since the Floodway was constructed and, in the 35 years of Floodway operation, there has been no reports that water from the Floodway has contaminated local groundwater.

7.1.3 Hydraulic gradients

The prevailing water pressure also plays an important role in determining whether or not groundwater contamination may occur. Infiltration to the unconfined aquifer is unlikely as long as the elevation of the groundwater surface exceeds the level of the floodwater in the channel. Infiltration of floodwater into the confined aquifer also would not occur as long as the pressure within the confined aquifer exceeds the pressure of the water in the channel. However, if the pressure in


ELEVATION
FEET
METERS
300
900
250
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700
200
600
500
150
WEST
DISCHARGE
EAST
RECHARGE
RECHARGE
RED RIVER
RED RIVER FLOODWAY
SILT
A
A
CLAY
TILL
SAND
TILL
CLAY
TILL
SILURIAN DOLOMITE
ORDOVICIAN LIMESTONE & DOLOMITE
DOLOMITIC LIMESTONE & DOLOMITE
ORDOVICIAN SHALE & SANDSTONE
PRECAMBRIAN ROCK
GROUNDWATER FLOW
PIEZOMETRIC SURFACE
0
10
20
30 (Km)
0
10
20 (Miles)

Regional Stratigraphic Cross-Section

Source KGS 2004d

Figure 7-1: A cross-section of the bedrock aquifer.

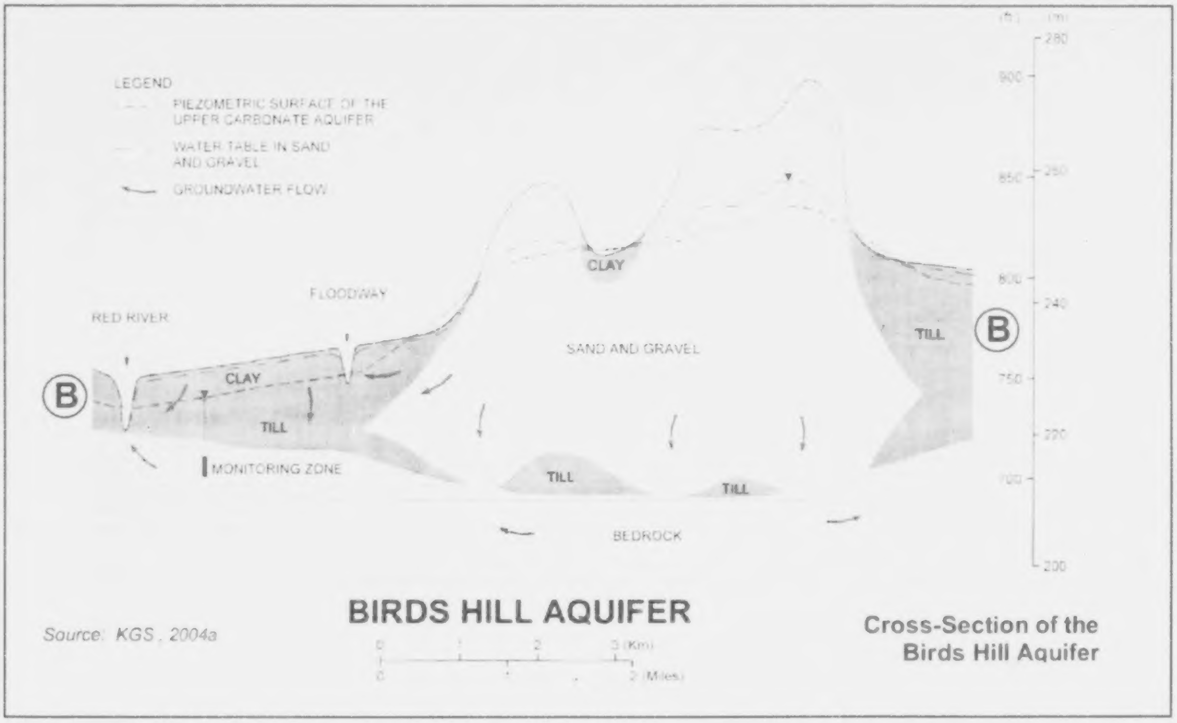
that aquifer is less than the pressure of water in the channel, then infiltration from the channel into the aquifer could occur. Infiltrating surface water could introduce contaminants into the fractured bedrock. Such a scenario could occur if the Floodway is filled to capacity with water for a considerable period. It could also occur under non-flood and flood conditions if the aquifer is utilized excessively for domestic or industrial purposes.

7.1.4 Modes of operation

Three different modes of operation need to be considered: the construction phase during expansion, inactive operation when the only flow in the Floodway is in the Low Flow Channel, and emergency operation when the Floodway carries large amounts of water from the Red River.

Construction Phase During Expansion: There are potential effects to groundwater during the construction of the expanded Floodway. This work, particularly around the bridge piers and the Winnipeg aqueduct, would require localized pumping of groundwater out of the soil (a process termed dewatering). This could lead to a drawdown of water in nearby residential wells. Also, widening of the Floodway through the Springhill ski area could cause increased leakage to the Floodway, thus lowering the level of the unconfined aquifer over time, if the leakage is not successfully contained by means of the clay plug that is under consideration. There are also potential effects on groundwater quality that could occur through the spillage of fuels, use of herbicides within the Floodway channel and the use or disposal of other chemicals of concern such as lubricants during construction.

Inactive operation: When the Floodway is not in operation, the limited flow is confined to the Low Flow Channel. Floodway expansion calls for this channel to be protected against erosion, providing an additional measure of protection to the groundwater. The water in the Channel during this inactive operation comes from the Seine River, various rural and municipal outflows, natural runoff, and the aquifers intersected by the Floodway. Under these conditions the groundwater discharges into the Channel, protecting the aquifers against contamination. Contaminants might enter during a non-flood time if drawdown of water from the confined


LEGEND
PIEZOMETRIC SURFACE OF THE UPPER CARBONATE AQUIFER
WATER TABLE IN SAND AND GRAVEL
GROUNDWATER FLOW
RED RIVER
FLOODWAY
B
CLAY
TILL
MONITORING ZONE
CLAY
SAND AND GRAVEL
TILL
TILL
TILL
BEDROCK
B
(ft) (m)
280
900
850
260
800
240
750
220
700
200
BIRDS HILL AQUIFER
0 1 2 3 (Km)
0 2 (Miles)

Source: KGS , 2004a

Cross-Section of the Birds Hill Aquifer

Figure 7-2: A cross-section of the Birds Hill aquifer.

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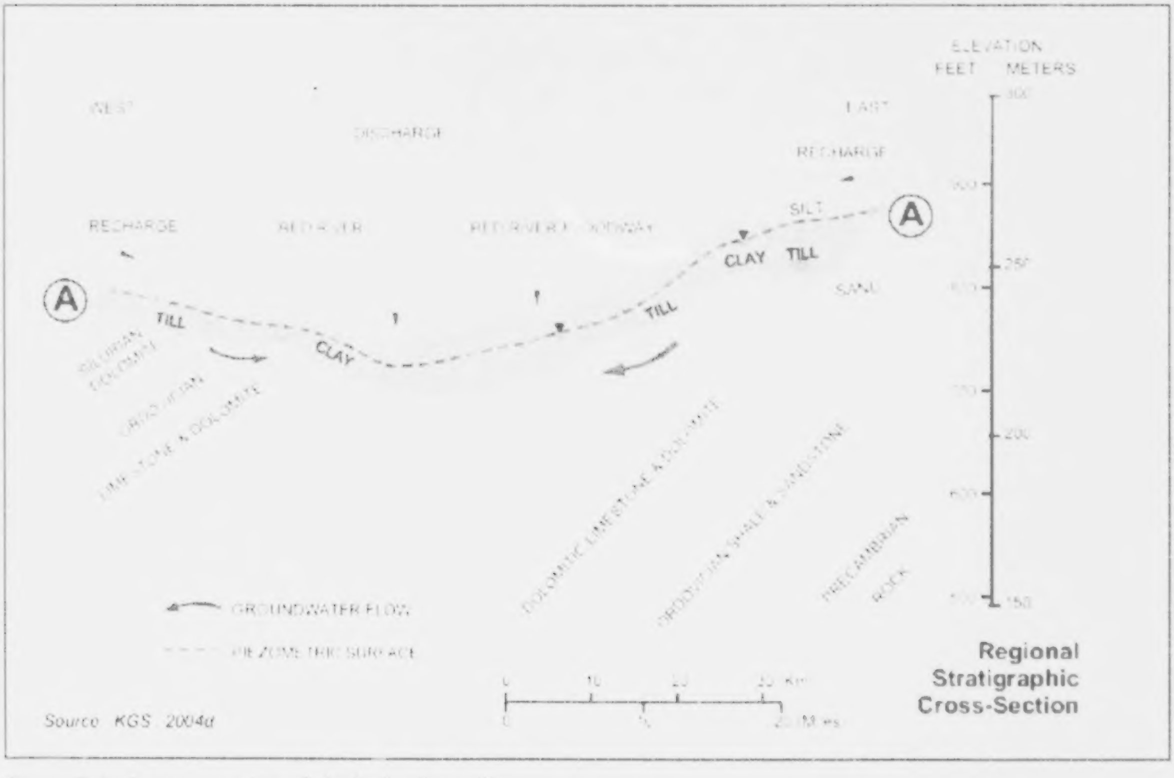
ELEVATION
FEET METERS
300
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WEST
DISCHARGE
EAST
RECHARGE
RECHARGE
RED RIVER
RED RIVER FLOODWAY
SILT
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CLAY
SILURIAN DOLOMITE
ORDOVICIAN LIMESTONE & DOLOMITE
DOLOMITIC LIMESTONE & DOLOMITE
ORDOVICIAN SHALE & SANDSTONE
PRECAMBRIAN ROCK
GROUNDWATER FLOW
PIEZOMETRIC SURFACE
0
10
20
30 Km
0
20 Miles
Regional Stratigraphic Cross-Section

Source: KGS, 2004d

Figure 7-1: A cross-section of the bedrock aquifer.

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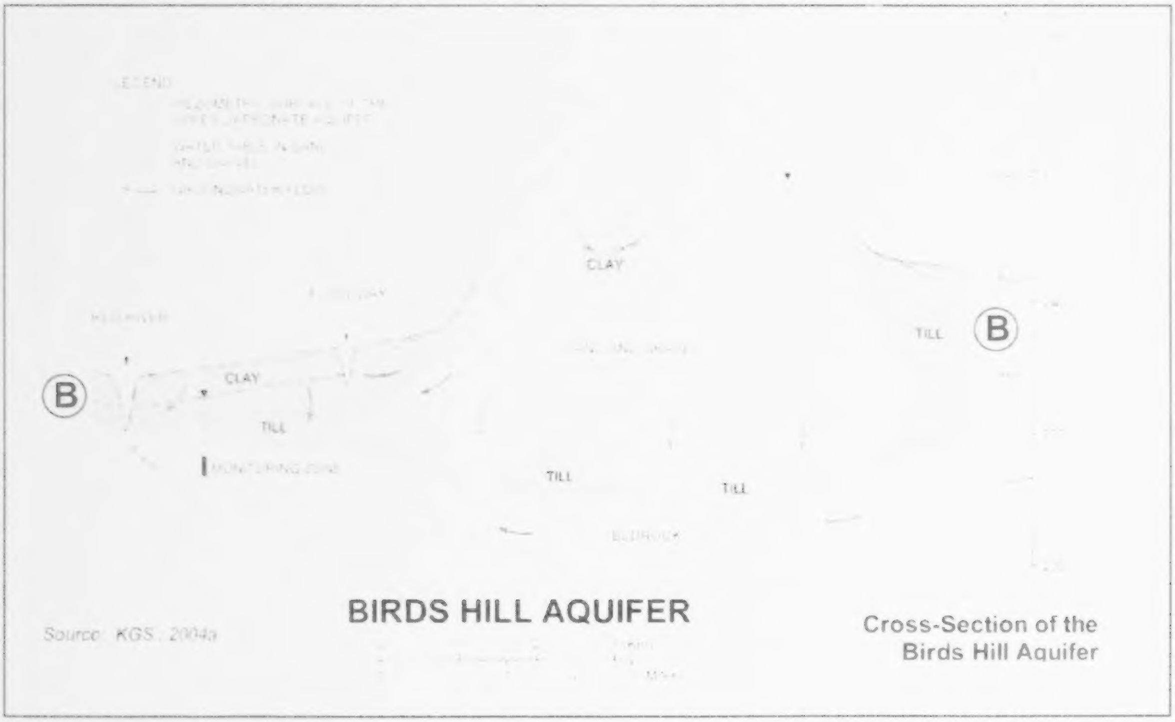

Figure 7-2: A cross-section of the Birds Hill aquifer.

aquifer reduces the pressure in the aquifer such that the springs no longer flow.

Emergency operation: During emergency operation, the level of water in the Floodway Channel increases dramatically. Depending on the size of the flood, most of the water in the Floodway may come directly from the Red River, or it may come from floodwaters that have left the Red River channel and flowed overland to the Floodway. During these operations, the water pressure may be sufficient to balance or exceed the natural pressure in the aquifer. If this were to happen, water from the Floodway could infiltrate the ground, particularly in the more northerly reaches of the Channel.

The question that then arises is 'will this water come into contact with the groundwater in the aquifer and contaminate it?' If the contaminants infiltrate the ground during a flood event, then after the flood event, the restoration of flow through the springs should push the contaminants back out again into the channel. The next question is 'how quickly will the infiltrated water leave the ground and will it all have left before the next use of the Floodway?' Since the current operating rules allow for both spring and non-spring emergency operations, it is possible for the Floodway to be operated more than once a year. The greatest risks to groundwater quality are associated with emergency operations. Also, the greater the amount of water in the Floodway and the longer it is there, the greater the potential risk to groundwater.

Since the construction of the original Floodway, there has been only limited ongoing testing to determine if there have been instances of groundwater contamination. During that period, there have been no reports that water from the Floodway has contaminated the local aquifers. However, an expanded Floodway would put more water into the Floodway, resulting in a flow of more water over a wider area. Nor is the prospect of aquifer contamination a hypothetical concern in this region: in East St. Paul, water from the Red River itself has contaminated the confined aquifer, demonstrating that pathogens can readily migrate extensive distances in the fractured bedrock. This event demonstrates that in the event of the groundwater being infiltrated with contaminated water, the regional geology is such that a health risk could develop.

In response to the groundwater concerns raised by the rural municipalities, the Minister of Water Stewardship announced in early 2005 that his Department would carry out a regional groundwater study for the area and the MFA indicated that they would support and participate in this study.

7.1.5 Key issues

The issues of groundwater quantity and quality are serious. Changes in quantity can have impact on local economies, growth patterns, and levels of development. As recent history has demonstrated elsewhere in Canada, failures to protect groundwater quality can lead to tragic outcomes. Furthermore, because the Floodway is not the only potential source of contamination for local groundwater, any deterioration in local groundwater sources can lead to protracted and bitter conflicts as individuals and agencies try to apportion responsibility for changes in groundwater quality. For these reasons, the key questions for the Commission on this topic are the following:

- Have adequate baseline data been collected to describe the current quality and quantity of local groundwater in the region traversed by the Floodway?
- Does the expansion plan adequately identify the potential pathways to the aquifers and take appropriate steps to prevent their being contaminated by water from the Floodway?
- Is there an adequate monitoring system in place to identify and quantify Floodway water infiltration into the groundwater?
- Will there be appropriate mitigation measures in place to remediate potential impacts of Floodway water infiltration into the aquifers?
- Are appropriate measures planned to address the loss of groundwater to the Floodway?
- Will there be appropriate measures in place to address a further lowering of the water table should this occur?

7.2 The MFA position

In its documentation and presentations, the MFA stated that groundwater issues had been of concern since the construction of the existing Floodway. As part of its engineering pre-design, numerous consultants in this field were engaged to collect and analyze groundwater information. Five separate groundwater reports based on 40 years of information were produced.

While issues of both groundwater quantity and quality were raised at the hearing, most of the MFA presentation focused on issues relating to groundwater quality.

7.2.1 Groundwater quality

The Environmental Impact Statement (EIS) concluded that the main potential source of negative effects on groundwater was deepening the Floodway Channel. The MFA felt that this threat to groundwater quality had been addressed by the decisions not to deepen the channel and by restoring the eroded Low Flow Channel to its original level. Once restored, it would be armoured against further erosion. These measures would mitigate the potential for increased surface water flow from the Floodway to the aquifer, thus limiting groundwater effects to within the Floodway right-of-way. MFA representatives stated that modelling had been done for the existing Floodway and for the expanded Floodway (as well as a sensitivity analysis for the expansion) and no adverse effects are expected on the water quality of nearby wells. Furthermore, it stated, the modelling had been done using a very cautious approach. The MFA therefore concluded that the effects on groundwater were not expected to be significant.

Despite these conclusions, the MFA also recognized that

- In areas with the highest potential interconnection to bedrock, there is a possibility for surface water to infiltrate into

Sidebar 7.1

The Kildare Outfall

The potential for contamination of the Floodway water flows was underscored by the discovery, made by consultants to the Coalition for Flood Protection North of the Floodway, that contaminated water was entering the Floodway Channel via the City of Winnipeg Kildare Avenue Outfall in the Transcona area. The Consultants sampled surface water on November 18, 2004, at six locations along the Floodway Channel. All drop structures had water quality typical of agricultural or storm sewer drainage except for the Kildare Avenue storm sewer outfall. At this location, a strong indication of fecal contamination was detected. The fecal contamination was diluted in the Floodway Low Flow Channel but was still detectable at the Dunning Road crossing 15-kilometres downstream.

Examination of water and sediment samples obtained on December 15, 2004, noted microbial impacts, indicating an ongoing discharge of untreated sewage. The level of fecal coliforms continued to indicate a health risk. The sediment material contained pathogenic organisms that could survive for a long time in the water in which they are resident. The Coalition consultants expressed concern that the outfall discharged directly into the Floodway Channel rather than into a receiving body of water that would provide some opportunity for digestion of the sewage prior to its release.

City of Winnipeg representatives told the hearing that the contamination of the outflow resulted from a temporary blockage in a wastewater (sanitary) sewer that led to an overflow to the land drainage sewer. The City official claimed such blockages are unusual and he committed the City to ensuring they would not reoccur.

It should be noted that the December 15, 2004, reading was made after the City of Winnipeg had been informed of the contaminated outflow and had stated that the cause of the contamination had been addressed. Residual entrapped fecal material in the system may have been the cause of these results; however, the Coalition consultants expressed concern over this finding.

the bedrock aquifer and migrate beyond the Floodway right-of-way.

- Proactive ongoing monitoring is important along the Floodway right-of-way, especially in areas in which springs are located, and in the Springhill ski area, to provide early detection of any impacts on the groundwater system.

In brief, there were five elements to the MFA approach to groundwater protection:

1. The decision not to deepen the Channel.
2. The decision to protect the Low Flow Channel against erosion.
3. Ongoing groundwater monitoring and mitigation.
4. The creation of an $11-million mitigation fund.
5. The establishment an overall public liaison committee.

The first two items on this list were relatively non-controversial. However, there is a need for further description and discussion of the last three.

7.2.1.1 Monitoring

The MFA identified five monitoring phases: baseline monitoring, pre-construction monitoring, construction monitoring, a five-year post-construction monitoring period, and a long-term monitoring period from 2014 onward.

Baseline monitoring

Detailed baseline monitoring is important to establish the quality and quantity of groundwater present in both aquifers prior to commencing construction. This will enable groundwater specialists to determine if there has been surface water intrusion into the aquifers during future Floodway operation. There is a significant contrast between the properties of the groundwater and the river water present in the Floodway from time to time. In particular, the river water is colder in the spring and contains fewer dissolved solids than the groundwater. Thus, the presence of colder than normal water with a lower level of dissolved solids in the aquifer could point to river water infiltration. The level of dissolved solids may be determined by measuring the electrical conductivity or through chemical analysis of a water sample. The MFA will also be examining specific changes in elements such as nitrate and microbiological indicators. Identifying the intrusion of river water into the aquifers on the basis of these contrasts requires a detailed understanding of the existing groundwater quality.

The MFA stated that baseline-monitoring programs are in place for domestic wells, monitoring wells, and channel base flow (year-round flow in the Low Flow Channel) resulting from groundwater blowouts or springs. These programs will include analysis of historic water chemistry and water elevation data from the provincial monitoring well network as well as from 200 private wells and 150 new monitoring wells.

Sampling has been focused on sensitive areas and samples have been taken from wells installed in the bedrock, till, and clay. Samples have also been taken from wells in sand in the general area of the unconfined Birds Hill aquifer. Samples have been taken from across the full width of the Floodway Channel to allow the MFA to monitor effects from the Low Flow Channel outward. Channel base flow has been measured at Dunning Road and water quality samples of base flow have been taken at 31 locations along the Channel. Further baseline monitoring is planned for before construction and during construction. The MFA stated that it intended to carry out timely analysis of the data obtained and report promptly to the designated regulatory authorities.

Pre-construction monitoring

Objectives of pre-construction monitoring include obtaining basic well-inventory data from private wells, groundwater quality data, and groundwater elevation data, as well as groundwater flow data on discharge to the Floodway. Well-water data has been obtained from 200 homes in the area. These data will be used for future groundwater quality and quantity comparisons.

Monitoring wells have also been sampled, with a focus on the detailed investigation of areas where there are wells in the bedrock and sand-

and-gravel layers within the clay and till deposits. Data from the monitoring wells were examined to establish long-term water quality.

Base flow is present in the Low Flow Channel year round from the Trans-Canada Highway north. This flow represents the groundwater discharge combined with surface flow along the channel. Base-flow quality measurements were taken at numerous locations along the channel. This included 12 locations where springs are present, as well as additional locations at bridge piers and where seepage was noticed.

Comprehensive groundwater-elevation monitoring forms the basis of monitoring for aquifer loss and is critical to acquiring geotechnical information. (Geotechnical refers to the application of geological knowledge to engineering problems.) Groundwater-elevation information will continue to be gathered from about 150 locations.

With regard to ongoing pre-construction baseline programs, MFA representatives stated that there are temporary weirs installed at four locations along the Channel to look at the varying amounts of base flow in order to better identify spring locations and the amount they contribute to the flow. Water-quality samples were also taken from these locations. To further the understanding of spring locations, the MFA is mapping the locations of open water and ice along the Low Flow Channel from Highway 1 to the Floodway Outlet.

Three monitoring programs are proposed for 2005: one starting in March, a second in event of spring Floodway operation, and one in the fall to obtain seasonal background data. These programs each include an extensive domestic and monitoring well-sampling program that will focus on wells in the bedrock aquifer. Additional monitoring wells will be drilled to expand the monitoring network, with the location of wells to be determined during final design. Sentinel wells equipped with monitoring probes that allow the MFA to track floodwater by measuring real-time changes in conductivity and temperature will be installed during this period.

If the Floodway is operated in the spring, the second program will sample wells that were sampled in March to provide continuity of information on such measures as water quality, bacteriology, and water level. The fall program will provide continuity and detail in areas of spring discharge and other issues.

Construction-period monitoring

Some of the goals of the construction period monitoring program are to look at the effects of project construction, to evaluate the success of potential mitigation measures and to provide long-term monitoring during non-operating and operating conditions, again with a major focus at looking for surface water intrusion during flood stages.

During construction, the MFA plans to monitor and mitigate the effects of dewatering. The mitigation measures under consideration include grouting, working on only one bridge pier at a time, supplying alternate sources of water, dewatering at lower rates, and pumping clean water back into the bedrock aquifer to create a hydraulic barrier to reduce the adverse effects. Environmental Protection Plans will be drawn up to address good fuelling practice and spill response and cleanup of hydrocarbons such as discarded engine oil and lubricants, herbicides and other chemicals that may be spilled during construction. The construction period monitoring program will be developed with the public liaison committee for approval by provincial regulatory authorities. Monitoring wells will be selected based on the proximity to construction and continuity to past monitoring.

Post-construction and long-term monitoring

The five-year post-construction period and long-term monitoring will focus on the effects of project construction and is meant to ensure that any mitigation measures put in place are successful. This will be followed by a long-term monitoring program of selected domestic and monitoring wells based on a review of project and regional data. Follow-up analysis will focus on the evidence of intrusion of river water with additional analysis being done as needed. All data will be reported to the designated provincial regulatory authority and to the public liaison committee. This program will be coordinated with Water Stewardship and Manitoba Health.

The MFA provided detailed information with regard to monitoring during a flood event. The concern is with the potential pathways into the bedrock aquifers where springs are located. While the focus is on the bedrock aquifer, there is also a concern with the sand-and-gravel aquifer. MFA representatives explained that there is technology available to enable them to measure temperature, pressure, and conductivity on a continuous, real-time basis. Sentinel wells are planned for this monitoring. These wells would enable the MFA to both monitor the groundwater and, if necessary, establish hydraulic control. (Hydraulic control, in this context, refers to the practice of pumping contaminated water out of the ground, perhaps at the edge of the Floodway right-of-way before it can travel further and putting it back into the Floodway.) Conversely, clean water can be pumped into the sentinel wells to prevent the further spread of contaminated water.

While sentinel wells will be placed across the Floodway right-of-way the focus will be on the west side as the groundwater flow is from east to west.

The MFA is not considering sentinel wells away from the right-of-way, as its objective is to have zero tolerance for contamination within the right-of-way. Should the first row of wells indicate an intrusion of river water, the MFA indicated that it would begin pumping out of the wells along the edge of the right-of-way at a rate of 900-to-1,350 litres per hour, returning the water to the Floodway Channel. This would pull any contaminated water from the vicinity of the Low Flow Channel towards the edge of the right-of-way and would also create a flow from the area where residents are located, thus protecting their water quality.

While the MFA has no expectation that there will be water-quality impacts extending past the right-of-way, if this should occur, then one of the short-term mitigation strategies would be to bring in hauled water for nearby residents. This could be done within a day and could carry on for a few weeks while the MFA considers other mitigation options. One option would be to drill new wells deeper into the bedrock. In some areas there is massive bedrock with little fracturing, and groundwater present in the bedrock below the contaminated level may not be affected. Ultimately, well-water treatment could be put into place, if necessary. Treatment would provide a significant barrier to all microbes including viruses.

7.2.1.2 Mitigation fund

The MFA announced an $11-million mitigation fund to address issues such as Floodway-related groundwater contamination and the loss of water supply as a result of further lowering of the water table. The details of how this fund would be operated have not been released. During the hearing, the MFA stated that it would be in charge of the compensation program and that a portion of the fund would appear in its operating budget each year. If the money were not spent in that year, it would not lapse. Furthermore, the MFA stated that if the $11-million fund were not sufficient, it would be augmented.

7.2.1.3 Public liaison committee

The MFA committed itself to establishing an overall public liaison committee for the entire project, with regional subcommittees for the sites where dewatering would occur as well as for other issues. It foresaw membership including the general public, rural municipalities, Manitoba Health, Manitoba Water Stewardship – Groundwater Approvals, and the Office of Drinking Water. The MFA also committed itself to a schedule of monthly or bimonthly meetings with municipalities to provide updates on the project.

7.2.1.4 Health-risk analysis

The MFA took the position that the EIS involved a form of health-risk assessment. The MFA stated that such assessments revolve around the identification and analysis of sources of contaminations, pathways of contamination, and potential receptors of any contamination. In carrying out the assessment, the MFA stated that it assumed the water in the Floodway was not potable water and its goal was to ensure that it did not travel by way of any potential pathway to reach humans through well water. In so doing, the MFA stated it employed the methodology of a health-risk assessment. However, the MFA did not call its analysis a full health-based risk assessment because it did not examine all potential pathways that contaminants from sources other than the Floodway could travel to the wells. (For more on health-risk assessment, see sidebar 7-2.)

7.2.2 Water quantity

The MFA stated that the decisions not to deepen the Channel and to armour the Low Flow Channel would mitigate the potential for increased water flow from the aquifers to the Floodway. The MFA also recognized that there was a potential for a drop in the water table elevation at Birds Hill, as widening exposed more of the unconfined aquifer. Widening in the vicinity of the Springhill Ski Hill could still result in an increase in the loss of groundwater to the Floodway. If this proves to be the case, a clay plug 200-300 metres in length and 2-3 metres in thickness would likely be required along the east bank of the Floodway.

7.3 Public comment

Consultants for both the rural municipalities of Springfield, East St. Paul and St. Clements, and the Coalition for Flood Protection North of the Floodway made substantive presentations at the Hearing on the issue of groundwater quality and quantity. The prevention of the entry of floodwater into the confined aquifer was seen by the three municipalities, the Coalition for Flood Protection North of the Floodway, and their respective consultants as a key issue before the Commission.

On the water-quantity issue, they argued that not enough work had been done to identify the springs through which the aquifers lost water to the Floodway. They were also critical of the fact the expansion plan contained no proposal to reduce this loss. The consultants also queried whether it would be possible to restore the Low Flow Channel to its original, pre-erosion elevations as proposed.

Questions were also raised about the adequacy of the modelling that the MFA had used to predict the degree of potential surface water infiltration during flood conditions. The Commission was warned against over reliance on models, and was told that while they are an important visualization tool, their results reflect the assumptions that are fed into them and provide one of a series of possible answers. For this reason, a well-designed monitoring network was required. The consultants questioned why contaminant-transport models were not used to determine where contaminants would go and how they would reach those destinations.

Models were also presented to the hearing that suggested that after a series of Floodway operations, surface water that had infiltrated into the ground would not necessarily be readily ejected. As a result, there was the possibility of the development of a long-term plume of contaminated surface water some distance from the Floodway right-of-way, and that there was

Sidebar 7-2

Health-risk assessment

Health-risk assessment or health-based risk assessment is a process that focuses on potential risks to human health. There are three main steps to the assessment process. In the first step, source and nature of the hazardous substance must be characterized to determine its toxicity. The second step involves assessing the pathway through which the substance can reach the receptor (population or habitat at risk). The third step would be determination of the impact of exposure to the receptor. For example, risk is low, even if the substance is highly toxic, if there is no pathway to exposure. However, a substance with a lower level of toxicity might constitute a hazard if there were a pathway to the receptor and exposure over an extended period of time. In the case of groundwater and Floodway expansion, the hazardous substance would be the contaminant (biological or chemical) in the water in the Floodway and the pathway would be that followed by the potential contaminant from its entrance into the aquifer to its entry into domestic water supplies drawn from wells tapping into the potentially contaminated aquifer.

the possibility of progressive degradation of the aquifer. (A plume is the residual surface water diffusing into and being moved by the groundwater.)

The reports and presentations reflected a concern with respect to infiltration of contaminated floodwater to the regional aquifer when the Floodway was in operation. The consultants told the Commission that areas beneath the Floodway that are underlain by clay, till, sand, or exposed bedrock could provide a pathway for infiltration of contaminated surface water. Once it had reached the confined aquifer, this contaminated surface water had the potential to travel long distances in the highly fractured bedrock. According to the consultants, a number of viruses—which can cause infection in very low concentrations—could be quickly transported significant distances in this sort of bedrock. Since the intensive livestock operations to the south of Winnipeg might represent one serious source of such contamination, the flow paths of the carbonate bedrock need to be documented. Finally, consultants expressed concern that insufficient work had been done on establishing a baseline for the monitoring of water quality and the presence of microbes.

One consultant (a groundwater-quality scientist) suggested the use of an impermeable liner covered by an impervious layer of clay and protected by rock riprap be examined as a means to prevent contamination of the underlying aquifer and to eliminate or reduce the infiltration of ground water into the Floodway when it is not being operated. A second consultant (a groundwater engineer), however, suggested that the underlying water pressure would prove too strong for such a barrier and cause it to lift. He preferred a series of wells along the Floodway that could be used to pump high-quality water from one of the aquifers into the area under the Floodway to inhibit the entry of potentially contaminated floodwater into the aquifer. During non-flood periods, these wells could be used to extract water for domestic supply. A third consultant (a groundwater microbiologist) was adamant that the fractured bedrock at the top of the confined aquifer could allow transport of potential contaminants some distance from the Floodway should infiltration of contaminated water occur.

Overall, the consultants concluded that progressive degradation of the aquifer, during successive flood events, is possible unless steps are taken during the design and construction stage to prevent the problem. This degradation of groundwater quality is a potential human-health risk. Despite these criticisms, the consultants indicated that the project should be licensed subject to a number of conditions:

- Establishment of a science-based mitigation and dispute resolution mechanism that includes an arms-length adjudicator; a fully funded, independent entity to implement remedial measures in a responsive forthright manner; and an appeal mechanism that is accessible to both parties.

- Recognition that the potential exposure of the aquifer to contamination by intrusion of surface water is a health risk and a cumulative effect that must be remediated. It is also necessary to undertake a human-health risk assessment on the groundwater systems in the vicinity of the existing Floodway to assess the impacts and risks on existing and potential future intrusion of surface water.

- Application of the as-low-as-reasonably-achievable (ALARA) principle to the reduction of groundwater loss and reduction in risk of groundwater contamination.

- Requiring the MFA to install, maintain and operate a comprehensive monitoring program to monitor groundwater levels and groundwater quality. Monitoring results must be regularly communicated to stakeholders in the potentially impacted communities. This program needs to be in place prior to the initiation of any construction dewatering.

- Requiring the MFA to set up a regional groundwater committee.

- Establishing a procedure and protocol to deal with adverse water quantity and quality effects for both the construction and operations phases.

- Carrying out of a comprehensive characterization of the channel, including the evaluation of the flow and water quality of each spring in the channel.
- Completion of a comprehensive pre-construction baseline water-quality sampling program for all potentially affected wells and contributing surface water courses.
- A need for Groundwater Under the Direct Influence of Surface Water (GUDI) analysis for all municipal and private wells in the area potentially affected by the infiltration of surface water to groundwater during flood events. This form of analysis determines whether a well is GUDI or non-GUDI. (A GUDI classifiation means that microbial pathogens are able to travel from nearby surface water to the groundwater source.)
- Establishment of wellhead protection zones around community water supply wells.

7.4 Commission comments

While the risk of groundwater contamination as a result of Floodway expansion is low, the consequences of such potential contamination are extremely serious. Furthermore, while it is likely that expansion would not increase the amount of groundwater that is being lost to the Floodway, the loss of groundwater is not a matter that can be taken lightly. The Commission intends to recommend a number of licensing conditions in relation to groundwater. This issue has drawn considerable attention from the residents of the rural municipalities through which the Floodway passes. Ongoing meaningful consultations must be part of the process of expanding and operating the Floodway.

As noted in the introduction to this chapter, Floodway-related groundwater issues cannot be adequately addressed without:

- An adequate baseline with respect to groundwater quality and quantity along the full length of the Floodway. Establishment of an adequate baseline includes the determination of groundwater surface elevations, major ion chemistry, contaminants of concern such as pesticide residues and bacteriological analysis. While there are no reported instances of the Floodway waters contaminating the local aquifer, there is a need for further investigation, monitoring and analysis of this issue. Each additional baseline monitoring point potentially decreases the MFA's possible liability and provides an additional reference point for the future. In the event of future changes in water quality or quantity, it is in the interest of all parties to have a solid database from which to deal with potential claims.
- Adequate identification of potential pathways to the aquifers and appropriate steps to prevent their being contaminated by water from the Floodway. This would require a full health-risk assessment.
- A comprehensive ongoing long-term groundwater monitoring program. This involves monitoring properly installed monitoring wells, using recognized sampling techniques and acquiring hydrochemical, bacteriological, and chemicals of concern data from sample analysis.
- Appropriate mitigation measures in place to address any floodwater infiltration of groundwater. This includes a wide range of potential mitigation measures. While the MFA has established an $11-million mitigation fund, it was not able to provide any detail on the process by which claims on this fund would be adjudicated.
- Appropriate measures planned to reduce the loss of groundwater to the Floodway. Should leakage occur, it would be very difficult and expensive, if not impossible, to correct.

The Commission heard conflicting testimony on these issues from highly qualified experts. It is important to note that the critics of Floodway expansion did not believe that the project should be abandoned. Instead, they argued that more robust measures need to be taken in relation to all the items identified above.

For this reason, the Commission is making a number of specific recommendations as to the sorts of conditions related to groundwater that it wishes to see attached to the license. The Commission also sees considerable merit in the suggestion that there be a third-party peer review of the Floodway expansion groundwater program and its implementation. For this reason, the Commission is recommending that the groundwater plan be subject to such a review. Because it is the MFA's intent to start work at the most southerly end of the Floodway Channel, where the aquifer is protected by a thick layer of clay, this recommendation would not provide any delay to Floodway construction. During this period it also ought to be possible for the MFA to fully characterize the extent of the loss from the aquifers through the springs in the more northerly two-thirds of the Channel.

Rural municipalities made it clear that they are concerned they would be marginalized once the licence has been issued and the project fully funded. It is extremely important that the MFA follow up on its commitments to ongoing public consultation. Elements of this consultation process should include:

- Regular meetings and a policy of transparency.
- Early disclosure of all material final design elements adequate to allow meaningful discussion of potential impacts, mitigation opportunities and alternatives.
- Review and comment on all proposed environmental and engineering studies.
- Fora to assess damage to municipal infrastructure resulting from construction activities.

Transparency on all issues related to public health is important to establish confidence in construction and operation of the Floodway. The publication of an annual MFA report on water quality monitoring would play an important role in the existing level of public distrust associated with Floodway expansion. While the Commission recognizes that the water in the Floodway Channel is potentially—and often likely to be—polluted, the City of Winnipeg should not be contributing to this problem. The City should regularly be monitoring and testing the outflow from the Kildare Avenue outfall to determine if this problem has been corrected. Should future testing once again indicate a presence of fecal contamination, then steps should be taken immediately to determine the source of the problem and to correct the situation.

Furthermore, the wastewater licence issued by the Manitoba government to the City of Winnipeg should require the City of Winnipeg to regularly monitor and report on the water quality of all City of Winnipeg outflows into the Red River Floodway Channel.

Licensing recommendations

As a condition of a licence to expand and maintain the Floodway

7.1 The Manitoba Floodway Authority ensure that a comprehensive baseline study is completed with respect to groundwater quality and quantity along the full length of the Floodway. This baseline study shall include information regarding groundwater elevations, major ion chemistry, compounds of concern such as pesticides, and bacteriological analysis.

7.2 The Manitoba Floodway Authority develop a comprehensive ongoing groundwater-monitoring program based on the results of the baseline. It shall specify monitoring well depths and general locations.

7.3 The Manitoba Floodway Authority ensure that there is no additional groundwater leakage to the Floodway as a result of expansion.

7.4 The Manitoba Floodway Authority carry out a comprehensive Floodway-related health-risk assessment.

7.5 The Manitoba Floodway Authority establish procedures and protocols to deal with adverse water quantity and quality effects for the construction phase.

7.6 The Manitoba Floodway Authority establish procedures and protocols to deal with adverse water quantity and quality effects needs for all phases of Floodway operations.

7.7 An arms-length appeal body be established to adjudicate claims regarding groundwater issues, this body to have the ability to respond quickly to public concerns regarding groundwater.

7.8 A peer review team be appointed which will review and comment on the following:

- The baseline information developed by the Manitoba Floodway Authority and the modelling carried out to date and recommend any further data collection and analysis they deem to be necessary.
- The ongoing monitoring programs proposed by the Manitoba Floodway Authority for both the construction period and over the long-term.
- The health-risk assessment carried out by the Manitoba Floodway Authority.
- Design and construction measures planned to prevent increased groundwater loss to the Floodway as a result of expansion.
- Techniques to be employed by the Manitoba Floodway Authority to prevent contamination of the Birds Hill and carbonate aquifer.
- The mitigation program proposed to be put in place by the Manitoba Floodway Authority.

The peer review team shall participate in pertinent committees and public meetings organized by the Manitoba Floodway Authority as part of the ongoing public-consultation process.

7.9 The Manitoba Floodway Authority provide an annual report on water quality monitoring to the Minister responsible. The report shall be available in the public registry and copies distributed to interested municipalities and members of the public.

7.10 The Manitoba Floodway Authority establish a public liaison committee.

Non-licensing recommendation

7.11 As a condition of its wastewater licence, the City of Winnipeg regularly monitor and report on the water quality of all City of Winnipeg outflows into the Red River Floodway Channel. These public reports shall be made on a quarterly basis. The City shall take remedial action when provincial water quality guidelines are violated.

Chapter 8

Ice jams and riverbank stability

In addition to concerns regarding artificial flooding, residents and organizations from locations both upstream and downstream of the Floodway presented the Commission with concerns about several other operating impacts of the Floodway. The two most significant concerns were the Floodway's impact on the creation of ice jams downstream of the Floodway Outlet and the Floodway's impact on riverbank stability upstream of the Inlet Control Structure and downstream of the Outlet Structure. This chapter addresses both of those issues.

8.1 Ice jamming

Like many north-flowing rivers in the northern hemisphere, the Red River is prone to ice jams. Severe ice jams between the Floodway Outlet and Lake Winnipeg are the major cause of flooding in that area. These jams can flood properties along the river and cut off access to areas of East Selkirk. Based on historical records, the frequency of ice jamming in this reach of the river has increased over the last number of years. One study indicated that in the period from 1852 to 1966, there were seven ice jams in the Selkirk area, while there had been six since the Floodway commenced operations.

This correlation suggests that there may be a relationship between the operation of the Floodway and the frequency of the formation of ice jams downstream of the Floodway Outlet. Ice jams can form very quickly and cause water to rise dramatically in a short period of time. Several individuals who made presentations to the hearing made it abundantly clear just how traumatic, dangerous, and destructive ice-jam floods could be. These impacts are all exacerbated by the frequent recurrence of ice jams in recent years. There is no question that there is a serious ice-jamming problem in the Selkirk area. The east approach to the Selkirk Bridge, for example, is vulnerable to ice jamming when river flows are as low as 800 cubic metres per second (m^3/s).

Ice jams are affected by a range of factors, including the thickness of the ice, the weather conditions in the spring, the degree of local runoff, and the flow rate of the river. These conditions can lead to either a thermal break-up, where the ice melts in the river without increasing water levels, or a dynamic break-up, in which a quick runoff raises water levels and breaks up the ice cover, creating the conditions for ice jams. Jams are likely to occur in situations where channel conditions—such as bends or islands—slow the flow, where downstream ice stops flow, or where there is a backwater effect from a large lake. These conditions are all present to greater or lesser degrees along the Red River downstream of the Floodway Outlet. Most of the causes of extreme ice jams are difficult to control, however increasing flow rates down a channel can increase the possibility of jams being created.

8.1.1 Public comment

The Coalition for Flood Protection North of the Floodway, a coalition of individuals who reside north of the Floodway and have been affected by ice jamming, argued that the Floodway exacerbated ice jamming by raising downstream water levels. In their presentation, they stated that the Floodway did this by adding an additional "slug" of water on top of regular Red River flow.

The Coalition's expert witness made two presentations to the hearing. During his first presentation, he stated that there had to be an impact of the Floodway on downstream water levels. However, he questioned whether the issue on which both the Coalition and the Manitoba Floodway Authority (MFA) had focussed—namely whether the Floodway caused an early arrival of a slug of water was significant—indeed, he termed it a red herring. He suggested that the construction of the Floodway and its expansion would lead to a more rapid draining of floodwaters upstream of the inlet since there were two routes for the water to travel down. He also indicated that he believed that the Floodway could exacerbate ice jams at high water flows by advancing the arrival of the peak flow in the Red River. He indicated that a flow of above 7,100 m^3/s with an expanded Floodway would advance the peak date by eight days. At that point the increased flow would be blocked by solid ice. He suggested the best way to alleviate the problem would be to extend the Floodway to Lake Winnipeg.

8.1.2 The MFA position

The MFA took the position that current and expanded Floodway operations do not and will not exacerbate downstream ice jamming. The issue that the MFA looked at was the one that had been initially raised by the Coalition for Flood Protection North of the Floodway, namely whether the opening of the Floodway gates delivers an additional initial flow of water that could exacerbate potential ice-jam situations. In evaluating this argument, there are a number of points that need to be borne in mind. The first is that, although the Floodway channel is much shorter than the meandering portion of the Red River that runs from the Inlet Control Structure to the Outlet Structure, under most conditions, water takes more time to travel down the Floodway Channel than it does to travel down the Red River from the Inlet Control Structure to the Outlet because the slope of the Floodway is much gentler than the gradient of the channel of the Red River. Second, when the Floodway gates are raised to increase flow into the Floodway Channel, they also decrease flow down the Red River. Increases in flow down one channel are then, in large measure, balanced by decreases in the other, faster-moving (but longer) channel.

The MFA presented studies that indicated that the travel time during early stages of a flood is considerably longer in the Floodway than in the Red River and much longer than through the river with no Floodway. It is only when a natural river flow of 2,800 m^3/s is reached that the travel times are equal. Another analysis of the spring runoff of 1996, a year of serious ice jamming at Selkirk, concluded that there was no evidence to suggest that the Floodway would have any detrimental effect on the ice break-up process.

The MFA recognized that ice jams were a problem downstream of the outlet and that the frequency of ice jamming appeared to be increasing. However, it pointed to two potential causes of the reported increase in ice jams. The first was to note that, since the construction of the Floodway there have been improvements in the collection of data regarding flow levels and ice jams. Second, during the years since the Floodway went into operation, there have been general increases in water flows in the Red River Valley. These increased flows, it was suggested, were responsible for the ice jams and would have affected the downstream area whether or not the Floodway was in existence.

8.1.3 Third-party comment

Because of the extreme divergence in opinion between the MFA and Coalition witnesses on the potentially significant issue of the Floodway's impact on ice jamming, the Commission brought in an additional expert witness to analyze the MFA documents and the testimony that had been presented during the hearing. He concluded that the current Floodway does not exacerbate the ice-related flooding. He further stated that expansion of the Floodway would not exacerbate ice jams and ice-related flooding. He noted that the Floodway, under certain conditions, would slow, rather than speed up, the arrival of water downstream of the outlet, although this was, at most, a difference of hours and is reduced at high flows. His other major conclusions were that:

- Ice jamming downstream of Lockport is most likely due to the reduced river slope and the backwater effects of Lake Winnipeg.
- Typical spring flood peaks have been about 50 per cent greater in the years following the construction of the Floodway. This likely contributes to the perception that the Floodway has increased the likelihood of ice jams and contributed to higher ice-related levels.

He also indicated that there were few short-term measures that could be taken to mitigate the effects of ice jamming. The most successful measures would be investment in infrastructure such as dykes. He also outlined a program of research and study that he believed would be useful in helping to identify the most effective ways to address ice-jamming issues in the area.

8.1.4 Commission comment

The Commission accepts the argument that Floodway operations do not exacerbate ice jams downstream of the Floodway Outlet. The Floodway does not increase flows downstream of the outlet except at very high flows, when ice has already been cleared from the river channel, and thus cannot have an impact on the ice regime downstream. With Floodway expansion, there will be virtually no impact on the pattern of flows downstream of the outlet for flows less than about 2,000 m^3/s and for flows greater that 2,000 m^3/s the changes in flow rates would be minor as far as ice conditions are concerned. Therefore there will be no effect on the ice regime.

In reaching these conclusions, the Commission recognizes that the evidence shows that ice jamming has been more frequent since the Floodway went into operation. However, it is also apparent that all of the ice jamming events recorded since 1969 took place under conditions of high flow. Secondly, the Coalition for Flood Protection North of the Floodway's expert witness gave testimony that at flow rates of 7,100 m^3/s the Floodway would create an earlier peak, thus hastening ice break up and ice jamming. However that level of flow has never been reached since the Floodway went into operation. Therefore, the Coalition witness's theory does not provide any link between Floodway operation and the increase in ice jamming that has occurred since the Floodway commenced operation. The expert witness that the Commission contracted also testified that flows of above 2,500 m^3/s are so large that they would lift the ice clear of the banks thus clearing the rivers of ice. If this were accurate, flows of 7,100 m^3/s would not contribute to ice jamming but clear the river channel of ice.

The Commission recognizes that ice jamming remains a serious and understudied problem downstream of the Floodway Outlet. The Commission is pleased that the Manitoba government has established a committee to examine the issue. Further study, along the lines outlined by the Commission's expert consultant on ice jams, would assist the committee in its work. In particular, there is a need for more work to be done in developing the record of ice jamming downstream of the Floodway and developing a description of the break up and ice processes downstream of the Floodway.

Non-licensing recommendation

8.1 The Manitoba government:

- Carry out an extensive review of historical ice-related flood levels at Selkirk.
- Better define ice conditions around Selkirk through a field program that observes break-up and measures ice processes between the outlet of the Floodway and Lake Winnipeg.

8.2 Riverbank stability

As the Red River travels through its floodplain, which is characterized by glaciolacustrine clays, its channel is constantly reconfigured. Riverbanks, particularly those composed of slump-prone clays, can collapse as a part of this process. The scouring action of moving water—particularly in times of flood—continuously erodes riverbanks and the eroded sediments themselves become agents of erosion. Banks slump when the gravitational force pulling down on them exceeds the forces holding the clays together. Natural and human influences such as spring ice flows, floods, the saturation of the upper banks from flooding, snowmelt, and septic fields can all lead to riverbank collapse. While riverbank collapse can be a natural process, it can have serious impacts for property owners along the Red River if portions of their land collapse into the river. Where riverbanks are identified as unstable, measures can be taken to strengthen the bank against further erosion and collapse.

8.2.1 Public comment

The Floodway hearings brought to light two concerns related to erosion and riverbank stability. The Coalition for Flood Protection North of the Floodway argued that there would be increased erosion downstream of the Outlet Structure because the river was being forced to carry more water. The most immediate point of potential erosion is at the Outlet Structure where the Floodway Channel empties into the Red River. At this point, the Floodway channel is 5 metres higher than the river. The energy of the water travelling from the Floodway Channel into the Red River channel, if not fully dissipated, could erode portions of the west bank downstream from the Outlet.

Several presenters from upstream of the Floodway Inlet, including the Ritchot Concerned Citizens Committee, spoke of riverbank failures on their property. They stated that they believed that these failures were the result of non-spring emergency operations of the Floodway, which had raised the water level very quickly and saturated the banks. As the river level fell, they believed the banks, which were heavy with moisture and not frozen as they often are in spring flood situations, collapsed.

8.2.2 The MFA position

The MFA pointed out that the Outlet Structure is being expanded and redesigned to increase its ability to dissipate the energy of the water in the Floodway Channel as it re-enters the Red River. In addition, the existing riprap on the west bank of the Red River, immediately north of the Outlet, will be repaired, and the erosion protection will be extended 1,200 metres downstream of the Outlet.

In the hearing, a Manitoba government representative stated that it did not appear that non-spring emergency operation had contributed to riverbank slumping, since the slumping that took place south of Morris—an area not affected by the non-spring emergency operation—was similar to the slumping that occurred north of Ste. Adolphe. The government representative also stated that a detailed engineering study had suggested bank slumping is a natural process that is not affected by Floodway operations.

According to the newly adopted Rule 4, water levels are not to be dropped by more than 0.3 metres a day—and the MFA has stated that the goal would be to lower them by not more than 0.15 metres a day—during non-spring emergency operation. This is intended to mimic nature so that gate operation has no impact on bank stability. The MFA has also committed itself to conducting riverbank stability tests. This test-hole and monitoring program would be carried out over a distance 30 kilometres upstream and 30 kilometres downstream of the inlet structure. The objective is to determine whether the operation of the Floodway has any impact on riverbank stability.

8.2.3 Commission comment

The measures being taken to protect the west bank of the Red River downstream of the outlet structure are considered adequate in providing protection against erosion. It is also clear that there is a need for the Manitoba government to establish a baseline on riverbank stability along the Red River.

On the issue of riverbank stability, it is generally thought that the sudden lowering of river levels may cause the saturated clay banks to fail before the water contained in the clay has an opportunity to drain and relieve the weight on the banks. This is known as a "rapid drawdown" condition. Repeated fluctuations in water level upstream of the Inlet Control Structure may therefore result in bank fatigue after a number of repetitions and could cause further deterioration of bank stability. In either case, in coming years, riverbanks along the Red River are going to continue to slump and collapse, as they have for hundreds of years. Unless the Manitoba government establishes a clear baseline for riverbank conditions, it will not be possible to determine to what extent Floodway operations contribute to such slumping. This is a disservice to those whose properties are affected by artificial flooding during non-spring emergency operations. Such a study could also serve as the basis for future stabilization measures.

Non-licensing recommendation

8.2 The Manitoba Floodway Authority proceed immediately with its proposed riverbank monitoring program. The program should determine whether Floodway operation has any influence on river bank stability and establish an up-to-date baseline of the riverbank.

8.3 Where it is determined that expanded Floodway operation has caused or exacerbated riverbank failures, the Manitoba Floodway Authority should be responsible for riverbank remediation and stabilization.

Chapter 9

Inlet Control Structure safety

9.1 Introduction

The Inlet Control Structure spans the Red River just downstream of the Floodway Inlet. During non-flood conditions the gates are in the submerged position below the bottom of the riverbed, with a minimum of 1.8 metres, but usually 2.4 metres of water flowing over them in the summer months. The crest of the Floodway Channel Inlet permits flows to enter the Floodway when the Red River flow exceeds about 850 cubic metres per second (m^3/s). The Floodway Inlet Control Structure gates can be raised or lowered to regulate the division in flow between the Floodway and the Red River channel. In this manner, the Inlet Control Structure serves as a dam that prevents large flows from entering the City of Winnipeg by diverting them into the Floodway.

A failure of the Floodway gates could place the residents of the City of Winnipeg at considerable risk. This structure and the adjoining east and west embankments and dykes are necessary for any active control of flows and river levels. Furthermore, if the gates become jammed in an upright position and cannot be lowered, upstream water levels could also increase. (Figure 9-1 shows a sideview of the gates.)

A key issue determining the safety of the Inlet Control Structure is the soundness of its foundations. The concrete inlet structure and the adjacent earthen embankments are founded directly on limestone. The only available information on groundwater conditions under the structure and embankments dates back to the time of the structure's construction in the 1960s. During construction of the Inlet Control Structure, groundwater flows were encountered in the limestone bedrock and at the contact with Quaternary sediments. This reflects the presence of open fractures that may be susceptible to enlargement through groundwater flow and dissolution of carbonates. (Quaternary is the name of the geological period during which these sediments were deposited. The Quaternary period covers 1.6 million years ago to present.)

At the completion of the Project Definition and Environmental Assessment (PDEA) studies that had been commissioned by the Manitoba Floodway Authority (MFA), some unresolved issues remained with respect to the Inlet Control Structure and the West Dyke. Principal among these was a difference of opinion between project consultants over the need for redundant (back-up) gates for the Inlet Structure.

In the fall of 2004, the MFA convened a panel of five experts to review outstanding issues with regard to the Inlet Structure and the West Dyke. Panel members were asked to focus on three principal aspects of concern.

1) The possible need for back-up gates versus improved reliability (termed supplementary redundancy) of the existing gates, or some other approach yet to be identified, for the existing Inlet Control Structure.

2) The design criteria related to the freeboard on the West Dyke.

3) The flood stages at or near the design stage at

the Inlet Control Structure and the proposed invoking of the "emergency overflow" operations that may include procedures or permanent facilities. (In short, what should be done in the event of 1-in-700-year or greater floods.)

Because the report of the expert panel was not completed before the hearing ended, its opinions and conclusions were not available for consideration at the Commission hearing. On April 19, 2005, the MFA provided the panel's draft report, Draft Discussion Paper on Expert Workshop, to the Commission.

9.2 MFA position

In response to questions regarding what investigations had been carried out to determine the present condition of the limestone (bedrock) foundation that supports the concrete Inlet Control Structure, and adjacent embankments, the MFA stated that the bedrock had not been investigated further for present conditions. Further, they stated that as part of the site investigations in the early 1960s, although karst conditions were not detected, the bedrock was found to be a dolomitic limestone with fracturing and some partings typically in the upper 3 metres and occasional clay infilling 10-to-50 millimetres in thickness. (Karst conditions are those where the limestone is slowly dissolved by groundwater flowing through fractures and enlarging them).

They noted that the construction of the base of the Inlet Control Structure was specified to be founded on sound bedrock and concluded "the present condition of the dolomitic limestone bedrock foundation is anticipated to be comparable to that at the time of construction in the 1960s."

While they concluded that the bedrock at the site was stable, they indicated they had not done any drilling at either abutment immediately adjacent to the concrete structure through the fill

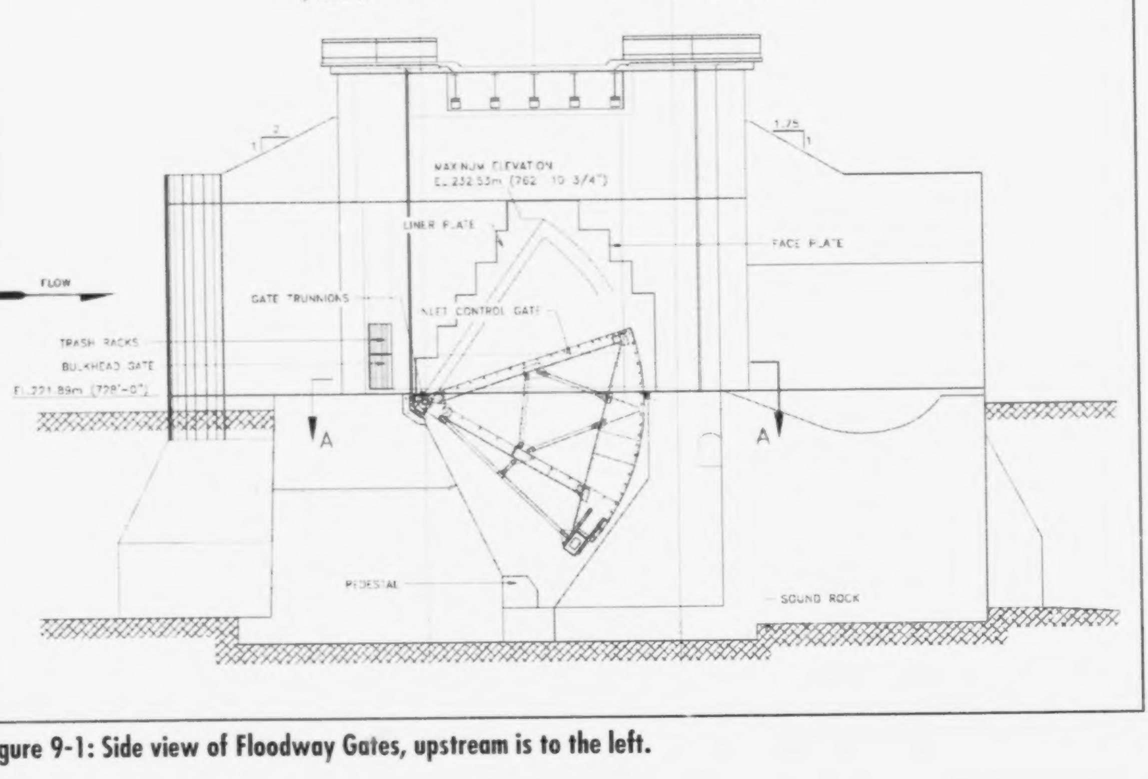
AXIS OF ROAD AND DYKE
℄ TRUNNION
℄ CYLINDER
2
1
1.75
1
MAXIMUM ELEVATION
EL.232.55m (762' 10 3/4")
LINER PLATE
FACE PLATE
FLOW
GATE TRUNNIONS
INLET CONTROL GATE
TRASH RACKS
BULKHEAD GATE
EL.221.89m (728'-0")
A
A
PEDESTAL
SOUND ROCK

Figure 9-1: Side view of Floodway Gates, upstream is to the left.

sections down into the bedrock or through the concrete structure itself. However they said, this could be done.

With regard to the tolerance of the operation of the gates to differential settlement of the Inlet Control Structure, the MFA stated that the structure is essentially a massive structure founded on sound rock and that there is no anticipated differential settlement. However, they suggested that no more than 1.5-to-3 millimetres of differential settlement would be tolerable in terms of gate operation, and no evidence has been reported that those types of settlements have occurred.

The MFA spoke of implementing the recommendations of the dam safety consultant contained in Appendix C to the Preliminary Engineering Report. (These recommendations are included as Appendix D of this report.) This would include upgrading and providing redundancy to the systems that operate the existing gates and fine tuning of design components outside of the Inlet Control Structure related to the reliability and redundancy of the whole system including the Inlet Control Structure, the Embankments and the East and West Dyke. Also under consideration for final design is the addition of a buoyant chamber within the gates so as to resist any tendency for the gates to settle or collapse.

The MFA indicated that it would be working with the Manitoba Emergency Measures Organization (EMO) in the near future to look at an evacuation plan for the City of Winnipeg. There is a need to finalize evacuation plans that will form a component of an emergency preparedness plan.

9.3 Public comments

One presenter expressed concern that because the report of the Expert Panel had not been finalized and made public at the time of the hearing, no assessment of the impacts of any proposed gate redundancy system could be made. The presenter indicated that a review similar to the hearing process should be conducted if the MFA proposes to install a back-up gate system.

9.4 Expert Panel Draft Discussion Paper

The discussion paper of the Expert Panel provides a number of important observations and points of advice. The following sections are drawn directly from their report.

9.4.1 General

> The capability and integrity of the West Dyke, the gated Inlet Control Structure, and the West Floodway Embankment [the West Floodway Embankment is an embankment between the West Dyke and the Inlet Control Structure] are all fundamental to preventing massive flooding in Winnipeg, and should be given very high priority in this project.
>
> Considering the large potential for loss of life, these components must be designed with sufficient safety margins to provide an extremely low risk of failure during passage of the [1-in-700 year] Design Flood, including allowances for contingencies such as unexpectedly high winds, or partial channel blockage.
>
> Opportunities should be taken to provide levels of safety or protection beyond minimum project requirements where this can be done at modest cost. One example is in the raising and extension of the West Floodway Embankment, where waste materials from the Floodway channel excavation can be used.
>
> For a range of floods larger than the Design Flood, very strong consideration should be given to an alternative to operating Rule 3, which currently calls for planned flooding of Winnipeg when upstream water levels reach 778 ft. With vulnerable areas evacuated, considerably larger floods could be forced through the Floodway channel by allowing upstream levels to rise somewhat further, encroaching on freeboard but not risking loss of life. This alternative could avoid massive property damage during such floods,

and should be factored into the project planning, at least as an available option. It is important that project-specific evacuation plans and assessment of their timing be pursued and completed as soon as possible for various vulnerable areas, so that the relevant information can be accounted for in the planning and design of this project.

9.4.2 Gates

Reliability of the existing operating gates should be improved by implementing measures proposed in the PDEA studies and by the Panel. These include aspects such as security; fire protection; some mechanical upgrades; and mandated high levels of regular maintenance and testing, with assured funding. Further fault-tree analysis should be used to quantitatively assess present reliability and various improvement measures. [Fault tree analysis is a graphical analysis that can help identify potential causes of system failure before the failures actually occur.]

Options for a cost-effective system of back-up to the operating gates should be studied in detail, with a view to implementing the most favourable option if possible. Assessments of evacuation timing will affect the importance of this. The back-up system must be adequately reliable, but not nearly to the extent required of the operating gates. The operating gates should be retrofitted, or back-up gates designed, with sufficient height to protect the City in the event of contingencies such as high winds, channel blockage or large local inflows; and to permit the alternative operating mode for flows larger than the Design Flood.

9.4.3 West Dyke Freeboard

West Dyke freeboard proposed in the PDEA studies is believed to be of the right order, but dyke erodibility should be further assessed and freeboard checked for other severe wind and overtopping conditions. Dyke height should also be adjusted to avoid local low spots when passing extreme floods.

9.4.4 Emergency Overflow Operations

Facilities and/or operational plans should be in place to deal with extreme floods, as is proposed in the PDEA studies, and should be such as to permit the option of protecting property in Winnipeg for a range of flows larger than the Design Flood. The scheme should include breaching of a section of the West Dyke that is well to the south of the most populated areas, and where the dyke height is not too great, as suggested in the PDEA studies.

An operational plan to actively breach such a section to the required extent is strongly favoured rather that provision of a fuse-plug type of washout section. If the designated section is made lower than the adjacent dyke, the amount should be small, and the dyke material relatively inerodible.

9.5 Commission comment

The Commission has identified two areas of concern:

- The soundness of the Inlet Control Structure foundation.
- Back-up for the gates.

9.5.1 Soundness of the Inlet Control Structure foundation

The concern is that fractures in the bedrock supporting the structure may be susceptible to enlargement through migration of groundwater, and dissolution of carbonates. This could lead to a differential settlement of the structure and, in an extreme case, may lead to the gates becoming jammed and inoperative.

While the information provided by the MFA with respect to foundation conditions is reassuring, considering the discrepancy in assessment of the potential for carbonates dissolution (karst processes), and possible minor settlement due to compression of clay seams in the bedrock foundations, the magnitude of the project, and the importance of the Inlet Control

Structure, it would be prudent to conduct an investigation to determine the hydrogeologic conditions below the structure and within the embankments. (Hydrogeology is a branch of geology concerned with groundwater.) This task could be accomplished by drilling inclined boreholes from each bank of the Red River.

It is the opinion of the Commission that vertical multi-piezometer observation wells should also be installed on both embankments to define present groundwater conditions within Quaternary sediments (sand, gravel, and till), at the contact of the Quaternary and Ordovician (bedrock) as well as within the Ordovician. (A piezometer is a device for measuring groundwater levels. Ordovician is the name of the geological period during which the sediments were deposited. The Ordovician Period covers the period between 505 and 438 million years ago.) Information from such exploration would confirm the present condition of the dolomitic limestone and would allow measurement of hydraulic properties of both bedrock and the overlying unconsolidated sediments.

A minimum of three vertical wells should be completed within a similar depth interval and within the same geological unit at each embankment. These wells would allow determination of groundwater flow direction, hydraulic gradient and assessment of flow velocity. Continuous monitoring of groundwater surface elevations would allow determination of the nature of the hydraulic connection between upstream of the Inlet Control Structure and the saturated part of each embankment. The collection of data from the monitoring wells would satisfy the surveillance requirements of the Canadian Dam Association Guidelines.

9.5.2 Back-up for the gates

The Commission is concerned that if differential settlement of the Inlet Control Structure were to occur, the gates could become inoperable. While the Commission agrees that this is unlikely to happen, the Commission is of the opinion that such a situation where the gates are rendered inoperable is unacceptable. The Commission agrees with the observations and advice of the Expert Panel in regard to the measures that need to be taken to ensure the safety of the Inlet Control Structure.

Licensing recommendations

As a condition of a license to expand and maintain the Floodway

9.1 The Manitoba Floodway Authority conduct a hydrogeological/geotechnical investigation beneath the Inlet Control Structure to determine the soundness of present foundation conditions. This should include the drilling of inclined bore holes.

9.2 The Manitoba Floodway Authority install a minimum of three vertical groundwater multi-screen monitoring wells on each embankment at the Inlet Control Structure to define present groundwater conditions within Quaternary sediments (sand, gravel, till) at the contact of the Ordovician (bedrock) as well as within the Ordovician.

9.3 The Manitoba Floodway Authority undertake a review of the possibility of the control gates jamming as a result of differential settlement after the hydrogeological investigation recommended above is completed. The Manitoba Floodway Authority shall undertake any required remedial action.

9.4 The Manitoba Floodway Authority establish and execute a regular monitoring plan, designed to meet the requirements of the Canadian Dam Safety Association for surveillance of the intake structure and adjacent embankments.

9.5 The Manitoba Floodway Authority provide a report within six months of the issuance of the license outlining its response to the Draft Discussion Paper on Expert Workshop and the status of the implementation of the key observations and advice contained in the report. This report shall be placed on the Public Registry.

9.6 The Manitoba Floodway Authority implement the recommendations of the consultant's report contained in Appendix C of the Preliminary Engineering Report for Floodway Expansion. The recommendations are included as Appendix D of this report.

9.7 The Manitoba Floodway Authority prepare a Project Dam Safety Review as defined in the Canadian Dam Safety Guidelines during the final design phase of the project, including preparation of the required Project Dam Safety Program. The Dam Safety Program should meet all the requirements of the Canadian Dam Safety Association Guidelines including an Operation, Maintenance and Surveillance Plan, Breach Analysis, Emergency Preparedness Plans and Emergency Response Plans (which are to take into account water management at all water inflows and conditions resulting from various possible failure events with the inlet and the dykes).

9.8 The Manitoba Floodway Authority carry out such repairs and upgrades as may be identified in the Project Dam Safety Review on a priority basis and no later than the end of the third year after construction.

Chapter 10

Beyond flood protection

During the course of the hearing, a number of issues arose that did not relate to Flood protection or the potential effects of construction and operation of the Floodway. In these cases, organizations approached the Commission with proposals as to how the value of the Floodway could be enhanced. The three main issues in this category were:

- Recreation.
- Rural drainage.
- The Seine River syphon.

This chapter addresses these three issues in that order.

10.1 Recreation

The Manitoba Floodway Authority (MFA) mandate requires it to enhance benefits the Floodway will provide to the community. These include recreation and economic development opportunities for local communities, training opportunities, and employment opportunities during construction. The Environmental Impact Statement (EIS) guidelines list "incorporation of recreational facilities to the maximum extent practical" as one component of the Project.

10.1.1 The MFA position

The MFA submitted that while a number of concepts were being reviewed and a working group was meeting with stakeholders, recreation and economic opportunities were out of scope of the current licensing process. Secondly, it was the MFA's position that the only viable recreation activity would be a network of trails. These, it stated, were landscaping measures that could be undertaken at the conclusion of construction. The MFA would make funds available for earth-moving related to trails but no decision had been made as to the size of the budget.

Beyond this, the implementation of any recreation or economic proposal would be the responsibility of the organization making the proposal. Proposals with a significant adverse effect on the environment would not be accepted. The proponents of such projects would be required to comply with all relevant environmental regulatory standards and any other applicable legislation.

The MFA committed itself to establishing a recreation working group to:

- Examine issues of recreational use along the Floodway.
- Examine the overall planning and design work process of the recreational component.
- Work in collaboration with MFA staff on the recreational component.
- Consider legal and liability issues associated with current unregulated use of the Floodway.
- Consider ongoing maintenance issues related to potential opportunities.
- Identify opportunities for financial support.

The MFA stated that it did not wish to rush into recreation because of concerns expressed by rural municipalities and people living along the Floodway. As an example, it stated that the relationship between farmers with hay and forage leases and the recreation proponents had to be resolved.

The issue of provision for pedestrian and bicycling crossing on bridges over the Floodway was raised during the hearing. The MFA stated that while the shy distance (the space left between vehicles and pedestrians as they pass each other) on the bridges and roads was being increased from 0.6 to 2 metres, making it safer for cyclists, for safety reasons, the Highways Department discourages sidewalks on its bridge structures. The MFA specifically stated that there would be a widening for bicycles on the Trans-Canada Highway Bridge and this would likely be the case on the Highway 59 Bridge. The MFA also stated that there would likely be a pedestrian/cyclist low level crossing at St. Mary's Road.

10.1.2 Participant positions

There were three viewpoints expressed by members of the public in relation to recreation. A number of recreation organizations supported recreational developments, while the leaders of the rural municipalities through which the Floodway travels voiced reservations. A number of individuals who lived near the current Floodway were particularly critical of management practices for the existing Floodway property.

10.1.2.1 Recreation organizations

The Rivers West–Red River Corridor Association represented a coalition of recreation interests functioning as the Red River Floodway Trail Coalition (RRFTC). At the time of the hearing, the Coalition had 34 signatories to a memorandum of understanding respecting recreation development of the Floodway. These included groups mandated to develop and promote trail use, sport associations, naturalist/conservation associations, a community economic development association, and two municipalities that lie along the Floodway Channel. In addition, several other associations made presentations supporting recreation development of the Floodway.

Rivers West argued that recreation could be one of the significant benefits of the project and these benefits would be most fully realized if recreation were fully incorporated into its planning. By not making recreation a part of the project, and by arguing that recreational activities are the responsibility of other parties, the MFA, Rivers West felt, was putting the existing synergy, opportunity, and funds at risk.

River West argued that it had brought together a remarkably diverse group that had been able to come to consensus and create a management group for any future recreation developments. It also recognized that currently there is unsafe and unsecured use of the Floodway, but felt these current conflicts regarding recreation could to be mitigated by consultation. Vandalism could be reduced if the Floodway were made more attractive, the public were provided with more access, and rules and codes of behavior were developed. It also recognized the importance of addressing the rural municipalities' emergency service concerns.

In its final presentation, Rivers West asked that the creation of a recreation project team be made a condition of licensing and that the RRFTC be designated a member of the team that would develop a recreation master plan. Under this proposal, the MFA would be required to set aside no less than 1 per cent and no more than 3 per cent of the overall project costs, excluding bridge enhancements. The MFA would be required to implement the plan, obtain all needed licences, and maintain all recreation related facilities. It also recommended that the MFA provide safe crossings for recreation purposes across the Floodway channel as warranted by existing and potential future demonstrable needs as identified in the master plan.

In addition to Rivers West and its affiliates, there were a number of other organizations and individuals that spoke in favour of expanded recreational use of the Floodway. One presenter suggested that there be two trail systems: one on the east side that was reserved for motorized vehicles and one on the west side for hiking and biking. This presenter believed that this proposal should ensure that the Floodway became a key link in the province's network of snowmobile trails. Support was also expressed for an increase in the size of the private ski facility along the Floodway bank.

10.1.2.2 The rural municipalities

While, a number of the municipalities that lie along the Floodway are signatories to the Rivers West memorandum of agreement supporting recreation, the focus of municipal presentations in this area at the hearing was on concerns with and objections to recreational use of the Floodway. These included:

- Property management concerns. There is no supervision and no control over recreation activities on the Floodway. Increased recreation use of the Floodway would lead to increased vandalism, security, and litter problems.
- Recreational use of the Floodway would lead to increased costs to the municipalities because of the need for emergency services.
- Concern that recreational activities would interfere with agriculture.
- The need for consultation. There should be no recreational development of the Floodway without consultation with the affected rural municipalities

10.1.2.3 Members of the public

A number of presenters from communities bordering the Floodway expressed reservations about recreational use of the Floodway, objecting to the association of recreation with a project that created artificial flooding. Others believed that recreational uses would lead to increases in vandalism and reduced privacy for people living near the Floodway.

There were comments from two or more presenters to the effect that funding recreation without first dealing with on-going public-health and economic issues resulting from past Floodway operation would be an inappropriate use of public funds.

10.1.3 Commission comments

Since Floodway expansion was, in part, promoted on the basis of potential recreation benefit, the Commission is concerned by the MFA's unilateral decision to declare recreation out of scope. Recreation will almost certainly be part of the Project before it is finished and should have been part of the licensing process. Given the larger interest in healthy living and aesthetic public works, the Commission is supportive of landscaping and recreational use of the project. The Commission understands and is respectful of comments to the effect that flood protection and resolving outstanding claims from past floods should come before recreation. However, the MFA and government obligation in those areas should not diminish this opportunity to maximize the potential benefits of Floodway expansion.

The Commission is also sensitive to concerns identified by the MFA about the hazards of pedestrian sidewalks on bridges. However, given the likely development of trails along the Floodway, there is a high probability that cyclists and pedestrians will use the bridges in any case. Design criteria for the bridges should incorporate these safety considerations in the planning stages of the Project.

Licensing recommendations

As a condition of a license to expand and maintain the Floodway:

10.1 The Manitoba Floodway Authority work with interested parties through the Floodway Recreation Working Group to develop a recreation and landscaping plan for the Floodway. The Floodway Recreation Working Group should include representation from interested municipalities.

10.2 The Manitoba Floodway Authority develop a draft recreation and landscaping plan suitable for public presentation no later than the spring of 2006 and finalize the plan no later than the fall of 2006.

10.3 The Manitoba Floodway Authority set aside no less than one per cent of the total Floodway budget for the development and implementation of the recreation master plan. This one per cent shall be in addition to the cost of the Floodway interpretative Centre and enhancements to bridges for pedestrian and cyclist safety.

10.4 The Manitoba Floodway Authority ensure that design criteria for all new vehicle bridges include a requirement for safe passage for cyclists and pedestrians over and under each structure and/or facilitate safe passage by alternative means consistent with trail plans.

10.2 Rural drainage

As noted in Chapter 3, the MFA is proposing reconstructing or upgrading five rural drainage drop structures that enter the Floodway Channel. These are the Centreline, North Bibeau, Springfield Road, Shkolny, and Ashfield structures. The Cooks Creek drop structure, built in 1984, will be repaired. The drop structures are the outlets for a number of rural Manitoba drainage systems. Their role is to allow drainage flows into the Floodway without erosion. The five structures to be reconstructed will be upgraded to provide them with the capability of handling a 1-in-100-year flow event. The Cooks Creek drop structure will continue to have a 1-in-50 year capacity. Improvements to the drains upstream from the reconstructed drop structures to the Floodway right-of-way will be constructed to the 1-in-50 year flow event standard. Cost of constructing and repairing the drop structures including lowering the inlet structure weirs to accommodate future local drain capacity improvements is approximately $3.6-million.

10.2.1 Cooks Creek Conservation District

The Cooks Creek Conservation District (CCCD) appeared before the panel with recommendations for further improvements in rural drainage into the Floodway. The CCCD was incorporated in 1979 under *The Conservation Authority Districts Act*. Member municipalities of the District include Springfield, Taché, Ste. Anne, Reynolds, and Brokenhead. The CCCD mandate to conduct conservation and resource management activities within its boundaries includes the provision of surface water management services to agriculture. The primary concern of the District is the provision of adequate surface water drainage infrastructure to meet present and future agricultural needs. When the Floodway was constructed, 14 streams and channels in the CCCD were combined into seven outlets into the Floodway, creating an overall improvement in the District's drainage capability. The CCCD stated that the Floodway had provided a net benefit with regard to drainage.

However, the CCCD told the hearing that there was poor internal drainage in the area; the land was flat, the clay soils provided little permeability, and compared to the rest of southern Manitoba, there was a high annual rainfall. When there is a heavy rain, the water sits for days, resulting in ponding and reliance on the surface-water management system. This threatens specialty crops such as beans, corn, and sunflowers, which are less tolerant to standing water than cereal crops. The hearing was told that in the CCCD, 15 to 20 per cent of the crop loss is due to wetness, amounting to an average annual loss of $7.4-million.

The CCCD recognized that the MFA was installing drop structures with a capacity that was greater than currently needed. However, the CCCD requested that the MFA be required to construct drop structures that incorporate the ability to handle further upgrading of the drains that feed the five outlet structures within the District. They suggested that the agricultural drain bottom elevations be 1.40-to-1.75 metres lower than the current elevation and requested that allowance for this be made in the design of the Floodway drains and outlet structures.

A second concern related to the number of outlets. Currently, there are more drains on the eastern side of the Floodway than there are outlets to the Floodway. Several drains run along diversions on the eastern edge of the Floodway and only enter the Floodway after merging with other drains. The CCCD argued that this impairs the functioning of the drains and requested the investigation of the possibility of adding new outlets at the Garven Road, the Springfield Road, Provincial Trunk Highway 15, Prairie Grove, and DeMeyer drains. The CCCD specifically asked that the MFA be required to investigate and report on all matters relating to the feasibility, including cost, of adding new drop structures.

10.2.2 MFA position

The MFA indicated that there are six agricultural drains along the east side of the floodway which flow into the Floodway channel via drop structures which dissipate the energy of the flowing water and thus reduce erosion. Due to widening of the Floodway Channel, it will be necessary to modify these structures. Of the six outlet structures, the MFA planned to reconstruct five and repair one. Four of the structures to be reconstructed and the one slated for repair are located within the CCCD.

The MFA indicated that it was working with the CCCD with regard to the design of the agricultural drains and drop structures within the District. In this regard, the target design life for the structures is to be in excess of 50 years and the drop structures will be designed with a hydraulic capacity to meet the 1-in-100-year flow event. The 1-in-50-year flow event would be used as the required hydraulic capacity for all primary drains to be reconstructed within the Floodway right-of-way. In addition to the drop structures, energy dissipation structures would be placed at the Floodway right-of-way boundary.

The MFA stated that the drop structure invert elevations would be lowered by about 0.6 metres during reconstruction to allow the approach drains to be deepened. It indicated that they were not convinced of the need for additional outlet drop structures and were of the opinion that they would be difficult to justify economically.

10.2.3 Commission comments

The MFA has taken reasonable measures to accommodate the concerns of the CCCD. It is providing a higher standard of design than commonly used for Manitoba agricultural drains and is taking into account a degree of future growth.

The Commission agrees with the CCCD that the design of the Floodway drains and outlet structures should accommodate long-term drainage needs and will recommend that the MFA work with the CCCD to reach agreement on what those long term needs may be and how those needs translate to drainage design and drop structure elevations.

For example, a "break out" panel could be designed and built into the outlet drop structure weir which would allow for simple lowering of the weir. Adjustments could also be made at energy dissipating structures placed at the edge of the floodway right of way through the use of sheet steel piling structures or gabion style weirs which could be cut down or lowered in the future.

The Commission encourages the MFA to continue to work with the CCCD to investigate and report on the need for and cost of additional drop structures as part of the CCCD drainage plan. At the same time, the Commission encourages the CCCD to recognize that a water strategy must go beyond drainage and should incorporate a total watershed management plan.

Non-licensing recommendations

10.5 The Manitoba Floodway Authority construct the drains on Floodway property and the outlet drop structures generally to the standards and elevations outlined in the EIS.

10.6 The Manitoba Floodway Authority work with the CCCD to determine and agree upon the long-term drainage needs of the CCCD including outlet drop structure elevations and build the necessary flexibility into their designs to adapt to the long term design requirements.

10.7 The Manitoba Floodway Authority investigate and provide a report to the CCCD on the need for and cost of additional drop structures as part of the final drainage design.

10.3 The Seine River syphon

The Seine River flow splits just south of the Winnipeg Floodway with a portion of the flow going into a syphon that runs under the Floodway, while the rest of the flow is diverted into the Floodway itself. At the hearing, Save Our Seine (SOS), a community-based stewardship group committed to preserving and enhancing the Seine River Greenway, made a presentation calling for improvements to the syphon and related infrastructure.

10.3.1 The Save Our Seine position

SOS seeks to increase flows through the Seine without causing flooding within the City of Winnipeg. The number of fish species and quantity of each could be augmented if water flows and water quality in the Seine River were increased. According to SOS, at its maximum, the syphon provides only 25 per cent of the flow that existed prior to the construction of the Floodway. Because of debris blocking the vertical grill at the inlet, the syphon often does not receive its full potential flow. The organization stated that the low-flow level means that there is not an adequate flushing of the Seine River floodplain within the City of Winnipeg. This deprives the flood plain of natural deposits of silt. Furthermore, a very high percentage of the flow in the Seine within the City of Winnipeg during the spring is polluted urban runoff. SOS also argued that the syphon and the Ste. Anne diversion of the Seine River in southeastern Manitoba served as barriers to fish movement, since the velocity and configuration of the syphon prevented fish from swimming upstream to spawn. Furthermore, when the water level in the Seine is low, the syphon serves as a fishtrap.

SOS called for:

- Replacement of the syphon and for provision for improved floodplain flushing and fish passage.
- Modification or replacement of the Grande Pointe Control structure for the Seine River diversion to permit flows to flush the floodplain in Winnipeg.
- An opportunity to review the examinations, analysis, and assessments of the design team and provide input into their findings.
- an MFA examination of the following project enhancements: channelling water from Old Prairie Grove Drain into the Seine, development of the land upstream and/or downstream of the Floodway, and integration of wetland habitat into recreation opportunities adjacent to the drop structure into the Floodway.

10.3.2 MFA position

While the MFA had not planned to increase the maximum flow of the syphon, it committed itself to ensuring that it reached its maximum more often. It stated that it could not provide the sort of flush the SOS wished to see, since that would negate summer flood-protection efforts in Winnipeg. It had not planned to replace the syphon; however it was applying for a *Navigable Waters Protection Act* licence for the existing syphon. In addition, the MFA is taking steps to make the entrance to the channel to the syphon safer and is also planning to install a self-cleaning parabolic grate to ensure more regular flow in to the syphon. (Because the grate is self-cleaning, there would be less chance of the inlet to the syphon being blocked with flotsam.) A hazardous floating trashboom will be removed and proper signage put in place to warn canoeists of the presence of the syphon immediately downstream. The MFA also stated that the grate to the Seine River Control structure located in the East ditch of Highway 59 is the responsibility of Water Stewardship and not the MFA. This control structure diverts Seine river flood waters along the East ditch to the Floodway rather than flowing through and potentially flooding the community of Grande Pointe.

10.3.3 Commission comments

The Commission congratulates and supports SOS for its work on reviving the Seine in the City of Winnipeg. The Commission recognizes the past effects of construction of diversions and the existing Floodway on the Seine River, which includes an absence of fish in the Seine

River between the Seine River Syphon and the control structure for the Seine River Diversion in St. Anne, Manitoba. As the expansion of the Floodway will not substantially alter the existing situation and the MFA has agreed to work with SOS to ensure the situation is not exacerbated and perhaps marginally improved, the Commission accepts the approach that MFA has taken. Having said this, the Commission also encourages SOS to continue its work and perhaps join forces with other organizations and agencies, including the MFA, in incorporating the long-term remediation of the Seine River into a regional watershed management plan in support of sustainable development principles.

Chapter 11
Going forward

The expansion of the Red River Floodway will dramatically improve the level of flood protection for the City of Winnipeg. The licensing measures proposed in the previous chapters, plus the various mitigation measures to which the Manitoba Floodway Authority (MFA) has committed itself, should ensure that Floodway protection does not have a negative impact on the environment. There remains a need for improvements in flood protection infrastructure in the City of Winnipeg and a government commitment to an ongoing investment in providing the human and financial resources required to meet Manitoba's flood protection needs. During the course of the hearing, questions were also raised about the need to improve the modelling the provincial government employs in assessing floodwater flows and their impact on erosion. This chapter is divided into three sections that look at the following issues:

- The need for the City of Winnipeg to upgrade its flood protection infrastructure.
- The need for government commitment to make continued investment in flood protection resources.
- Computer modelling and flood forecasting.

11.1 City of Winnipeg

Throughout the 16-days of hearings into the proposed expansion of the Red River Floodway, there was one issue that was never in doubt: the City of Winnipeg would receive tremendous benefit from this project. The 1997 flood demonstrated that the City was vulnerable to a 1-in-100-year flood. Expansion promises to give the City protection from a 1-in-700-year flood. This level of protection is based on an important assumption in the Preliminary Engineering Report: namely that the City would either upgrade its primary dykes to permit the safe passage of 2,270 cubic metres a second (m^3/s) (the flow that would be required to pass through the City during a major flood) or ensure that temporary dykes could be erected in time to permit the passage of this flow.

Winnipeg's 110 kilometres of primary dykes were constructed following the 1950 flood and run, usually along roads, parallel to portions of the Red, Assiniboine, and Seine rivers in Winnipeg. (See Figure 11-1) The minimum elevation for the primary dykes was 26.5-feet above JAPSD (229.9 metres above sea level (ASL)), however during the 1997 flood it became apparent that there were portions of the primary dykes that were not at this elevation. At their current level, the primary dykes could not pass a flow of 2,270 m^3/s. To provide this level of protection will require raising the dykes to 28.5-feet above JAPSD (230.5 metres ASL). The cost of such a measure would be $149-million. A further $107-million is required for additional measures required such as control gates and pumps to protect against backups of river water into the sewer system, a failure of the secondary dykes, excessive rainfall events, and the loss of flow capacity at waste water treatment plants. Since 1997, the City has spent $14.4-million on flood control upgrading and budgeted an additional $25.7-million for the 2005-2010 period.

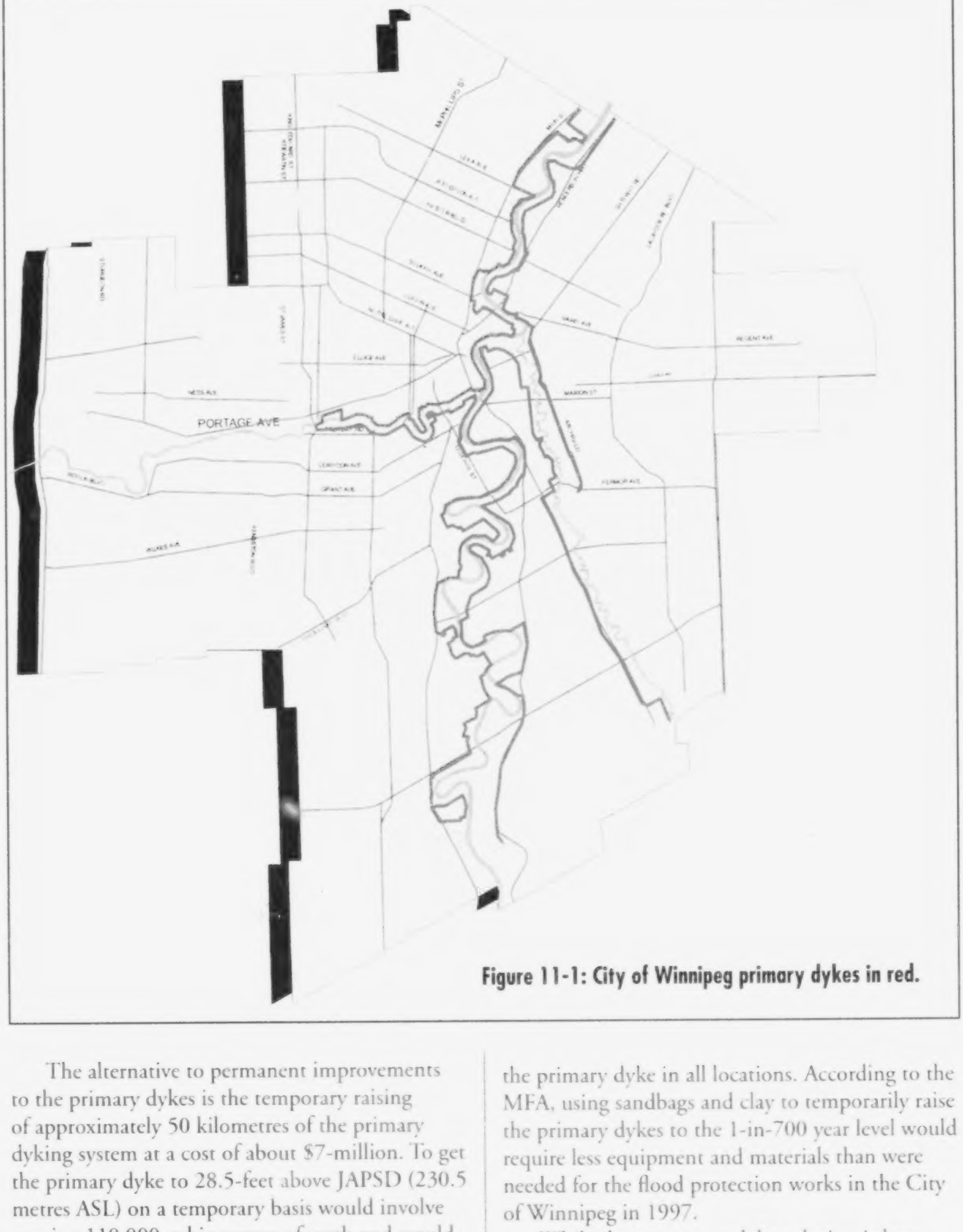

Figure 11-1: City of Winnipeg primary dykes in red.

The alternative to permanent improvements to the primary dykes is the temporary raising of approximately 50 kilometres of the primary dyking system at a cost of about $7-million. To get the primary dyke to 28.5-feet above JAPSD (230.5 metres ASL) on a temporary basis would involve moving 110,000 cubic metres of earth and would take one-to-two weeks, provided enough warning is received. Due to the steepness of the sideslope, it might not be possible to increase the height of the primary dyke in all locations. According to the MFA, using sandbags and clay to temporarily raise the primary dykes to the 1-in-700 year level would require less equipment and materials than were needed for the flood protection works in the City of Winnipeg in 1997.

While the temporary dyke solution is less expensive in the short-term than a permanent raising of the dykes, temporary dykes need to be constructed for each flood event, must be constructed in a very short time, and are dependent on accurate flood forecasting. Because the dykes are incorporated into the road system, temporarily raising the primary dykes would limit access to parts of the City. Difficulties can also arise from the impact of weather conditions on the construction materials for the dykes. Finally, because temporary dykes are less reliable than permanent dykes, it would be necessary to evacuate a portion of the City in the event of an extreme flood emergency. A permanent structure would not have to be constructed under emergency circumstances, would place no limitations on traffic, would be far more resistant to breaches, would not require evacuation, and would not be vulnerable to last minute changes in weather forecasts.

11.1.1 The City of Winnipeg position

As the City of Winnipeg's presentation to the hearing acknowledged, without permanent increases in the height of the dykes, there is less than 1-in-700-year protection for the city. Both the City of Winnipeg and the MFA took the position that while temporary measures would serve to provide needed protection, a permanent raising of the primary dykes was the preferable solution. The City of Winnipeg took the position that it would have preferred to have seen the raising of the primary dykes and the additional flood-proofing works included as a part of the Floodway expansion project. It went on to recommend that:

- The expansion project proceed without delay.
- The city, provincial and federal governments work together to permanently raise the primary dykes in Winnipeg.
- The city, provincial and federal governments work together to upgrade the other critical flood-control infrastructure in Winnipeg.

In its supplementary filings, the MFA also included portions of the 2004 report entitled *Investigation of the Merits of Management of Red River Summer Water Levels in the City of Winnipeg.* That report notes that one alternative to operating the Floodway in the summer to lower river levels would be to increase the size of and/or add additional flood pumping stations in the City of Winnipeg. The report stated that "Based on a cursory assessment of this alternative, it was concluded that the high costs required to upgrade the Flood Pump Stations make this option not a viable alternative to summer water level control."

11.1.2 Public presentations

Participants and presenters from outside the City of Winnipeg raised two issues in relation to the City of Winnipeg's level of flood preparedness. The first was essentially a question of social equity. They pointed to the fact that to take advantage of the Red River Valley Flood Proofing and Dike Enhancement Agreement flood proofing benefits, property owners outside of ring-dyke communities had to contribute up to 25 per cent of their flood protection costs (up to $10,000) on expenditures under $70,000 and 100 per cent of the cost over $70,000. Similarly rural municipalities had to contribute 10 per cent of their flood-protection costs in order to participate in the program. It appeared to these residents that the Manitoba and federal governments had required upstream residents and municipalities to contribute to their flood proofing but were proposing to pay 100 per cent of the cost of the Floodway that protects Winnipeg.

The second issue related to concerns as to what would happen if a 1-in-700-year flood took place and it was discovered that temporary raising of Winnipeg's primary dykes did not provide adequate protection to the City of Winnipeg. It was feared that in this situation, the Manitoba government would alter the operating rules to protect the City and further increase artificial flooding upstream of the Floodway.

11.1.3 Commission comment

While the City is the primary beneficiary of the Floodway expansion, it is not contributing directly towards the expansion, which is being paid for by the Manitoba and the federal governments. This is a departure from the customary practice in which there is federal, provincial, and local contribution to infrastructure projects. This is an issue on which the City of Winnipeg must demonstrate leadership and financial commitment. Its flood-control infrastructure requires approximately $250-million in upgrading. Currently, the City is proposing to spend $5-million a year on flood infrastructure. In its presentation, the MFA stated it could take over 20 years to make all the required improvements. This is not an adequate response. Nor is it appropriate for the City to simply call for additional federal and provincial funding and rely on temporary flood-protection measures.

The City's lack of adequate flood-control infrastructure not only places Winnipeggers at risk but also jeopardizes the flood-control measures taken south of the Inlet Control Structure should the provincial government once more find it necessary to make emergency changes to the operating rules to protect the City. Insufficient investment in gated outfalls and flood pump stations has left the City vulnerable to basement flooding and sewer back up in the summer and fall.

The City of Winnipeg needs a clear plan for fully upgrading its flood-control infrastructure within 10 years. Given the cost that this involves and the benefits that will arise from such a plan, federal and provincial funding may be justified. However, the City of Winnipeg cannot simply wait for commitments of outside funding—it must make a significant commitment to flood-control infrastructure.

Non-licensing recommendations

11.1 By 2015, the City of Winnipeg complete permanent raising of the primary dykes and needed improvements to control gates and pumping stations to allow the City to permit the safe passage of 2,270 m^3/s of water down the Red River.

11.2 The City of Winnipeg, the Government of Canada, and the Government of Manitoba work cooperatively toward the financing of improvements to Winnipeg's flood-control infrastructure.

11.2 Flood management resources

Flood management, including forecasting and flood-protection operations, is an important and complex matter. The nature of floods in Manitoba can vary widely depending on where the flows originate (the Red or the Assiniboine River), the amount and rate of precipitation, whether peaks coincide or occur at divergent times, and the presence of ice jams and debris. It is obvious that the maintenance of flood-control infrastructure must be of the highest priority. The major flood-control infrastructure such as the Floodway Inlet Control Structure and Channel, the Portage Diversion and the Shellmouth Dam must function as designed. In addition, there are numerous other secondary control gates, structures and diversions that must be maintained so that they also work when required. Failure of any of these could result in devastating consequences. Diversion channels such as the Floodway and the Portage Diversion must be kept clear of trees and bushes if they are to operate at their expected capacity.

Dealing with a potential flood begins with the forecast of flows and water levels. The City of Winnipeg must be informed as early as possible as to whether it will have to mobilize for a flood, operate its flood-fighting infrastructure, and most importantly, raise the primary dyking system. To the City, early and accurate flood forecasting is imperative.

Similarly, rural municipalities and residents, both south and north of the City, require early notification of any flood risk. They need to have an idea how many sandbags may be needed, and be able transport the bags and evacuate areas while road access is still available. Flood fighting includes operation of the major control structures, secondary facilities, liaising with rural municipalities, and ensuring that problems are anticipated before they become too large to handle.

Trained and experienced staff must be available to deal with the foregoing issues. For example, it takes a trained and experienced specialist to sense whether flood forecast input and output data are reasonable. Similarly, flood-fighting field operations require experienced staff knowledgeable in the operation of the infrastructure and able to anticipate problems. Manitoba has been well served by those public servants responsible for flood protection. It is important that the Manitoba government retain, recruit, and train experts of similar quality in coming years. A budget sufficient for proper maintenance of flood-control infrastructure must be set aside and maintenance must be carried out on a timely basis. Given the infrequency of major floods, it may be tempting to allocate funds intended for infrastructure maintenance for other purposes. The result of such a policy, however, could be disastrous.

Non-licensing recommendations

11.3 The Manitoba government hire, train, retain, and properly resource skilled and experienced flood forecasters.

11.4 The Manitoba government ensure there is a sufficient, well-trained complement of staff available to deal with floods. The Manitoba government ensure that plans are in place to access and train additional staff for major floods.

11.5 The Manitoba Floodway Authority budget adequate and dedicated funding for the proper maintenance of flood-protection infrastructure.

11.6 Manitoba Water Stewardship budget adequate and dedicated funding for the proper maintenance of flood-protection infrastructure such as the Portage Diversion and the Shellmouth Dam.

11.7 The Manitoba Floodway Authority, Water Stewardship, the Manitoba Emergency Measures Organization, and all others involved in operating and maintaining the Floodway establish flood management procedures that clearly define their roles and responsibilities and budget requirements, to support the safe operation and maintenance of the Floodway.

11.3 Flood modelling issues

Computer models play an increasingly important role in simulating the effects of potential flood scenarios and in making annual flood predictions. Designs for Floodway expansion were, for example, tested with various models to determine the impact of different flood scenarios on proposed designs. There are two alternative approaches to flood modelling. The first is the one-dimensional approach, which represents the topography in a series of one-dimensional channel cross-sections. The alternate, two-dimensional approach, involves establishing a series of calculation points in a landscape and then connecting the points to adjacent points to create triangles that form a grid or a mesh. While the two-dimensional approach can, if the mesh is fine enough, provide a more detailed picture of water flows, it requires more data, more time, and more resources to establish and operate. Both MIKE-11 (a one-dimensional model) and Telemac 2D (a two-dimensional model) were used to evaluate the design of the Floodway expansion. Manitoba Water Stewardship uses the MIKE-11 model in developing its ongoing flood forecasts.

The consultant for the 768 Association presented the Commission with a critique of the use of MIKE-11.The consultant maintained that MIKE-11 was not be able to simulate water levels and velocities as accurately as the Telemac 2D. The consultant also stated that in some cases, the Telemac modelling carried out by the MFA did not use a sufficiently fine a grid or mesh. As a result, he said that the model did not fully capture localized floodwater velocities around individually flood-proofed homes and at protruding corners of larger dykes, places where flow acceleration would typically occur over short distances. As a result, he said the possibility of potential localized erosion problems occurring during future floods could not be ruled out. One particular area of concern that the consultant identified was the Avonlea Corner on the West Dyke. This corner of the dyke, northwest of Ste. Agathe, is a prominent projection into the floodplain in a major flood and could be subject to erosion. (Figure 11.2)

The changes since 1999 to house pads and small ring dykes may not have a significant effect on water levels. However, the surest way to answer this question would be to update the Telemac model with all the changes, using a finer mesh in areas where clusters of pads and dykes exist, then test for impacts of the Floodway Expansion Project on water levels with the updated model.

A representative of Manitoba Water Stewardship described the Manitoba government's current approach to modelling. He explained that the MIKE-11 model would allow the government to determine water levels across the valley in the event of a flood similar to that of 1997. During a major flood, MIKE-11 would allow the government to provide the public with site-specific forecasts on its website. The official also acknowledged that the two-dimensional models are superior in a number of aspects, but he noted that they were more difficult to use and took considerably more time to run. He also noted that Manitoba is cooperating with US jurisdictions to extend the MIKE-11 modelling process up the Red River Valley to South Dakota. While it is likely that in a decade it will be possible to use two-dimensional models on a field of this size, he did not believe it was currently feasible to do so. Again, he noted that Manitoba did use two-dimensional models to focus on specific areas. For its part, the MFA stated that it was aware of the potential for erosion at the Avonlea Corner and would be providing erosion protection.

The Commission believes that using one flood-forecasting model in both Canada and the United States is appropriate, with the understanding that two-dimensional models will be used where more detailed information is beneficial. Given the changes in flood-protection measures since 1997, it would also be appropriate that erosion around small dykes and house pads be monitored during the next major flood.

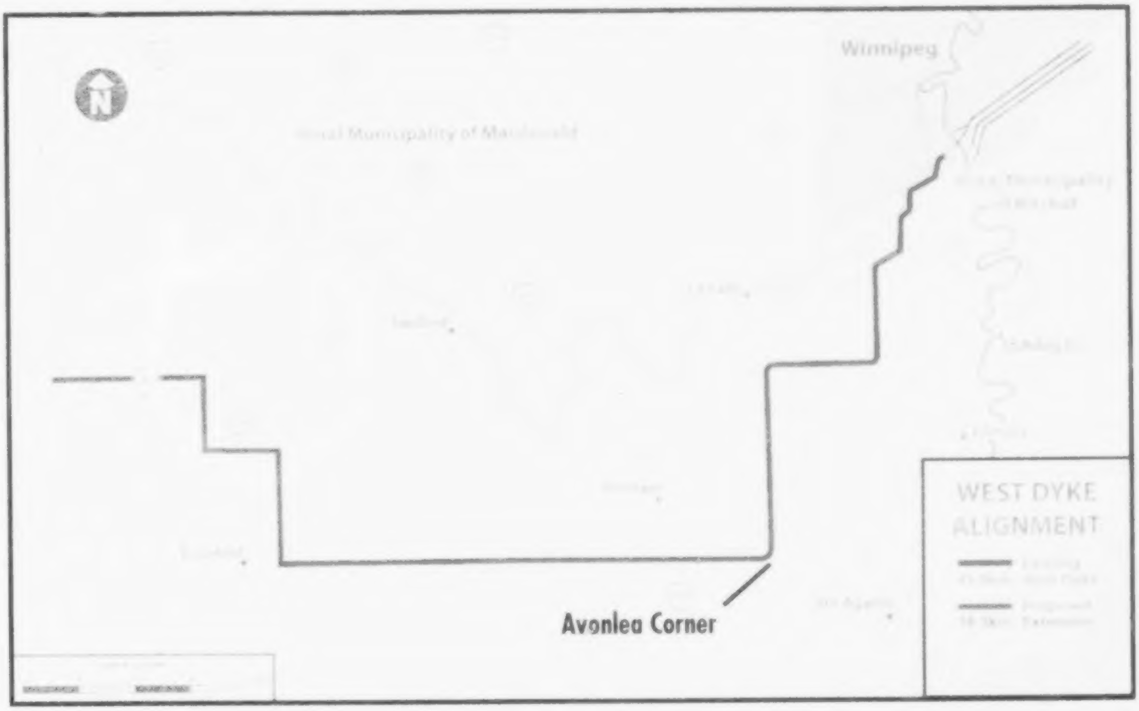

Figure 11-2: Avonlea Corner

Chapter 12
Sustainable development

12.1 Background

12.1.1 *The Principles and Guidelines of Sustainable Development*

The Commission's terms of reference state that its recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *Sustainable Development Strategy for Manitoba*. Furthermore, the guidelines for the Environmental Impact Statement (EIS), stated that the EIS is to "Incorporate and reflect the Principles of Sustainable Development as contained in *Towards a Sustainable Development Strategy for Manitobans.*"

Sustainable development is defined in *The Sustainable Development Act* as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." The Act, proclaimed in July 1998, mandates all government departments and Crown corporations to adhere to the principles and guidelines of sustainable development and to incorporate sustainable development practices into their activities. As a Crown corporation, the Manitoba Floodway Authority (MFA) is bound by the provisions of *The Sustainable Development Act*.

The *Sustainable Development Strategy for Manitoba* was created in response to the Act and has been adopted by the government of Manitoba.

The Principles of sustainable development can . be summarized as follows:

- Integration of environmental and economic decisions.
- Stewardship.
- Shared responsibility and understanding.
- Prevention.
- Conservation and enhancement.
- Rehabilitation and reclamation
- Global responsibility.

The Guidelines for sustainable development can be summarized as follows:

- Efficient use of resources.
- Public participation.
- Access to information.
- Integrated decision making and planning.
- Waste minimization and substitution
- Research and innovation.

The Principles and Guidelines of Sustainable Development appear as Appendix E of this report.

12.1.2 *The Sustainable Development Strategy*

The Sustainable Development Strategy for Manitoba established goals and general procedures to provide for the continued active participation of all citizens in implementation of sustainable development principles. Respecting the public sector it states:

> Achieving sustainability requires a change to the very character of society; fundamental change in the way business is done, what is taught to our children, how we as individuals live and how government and public institutions govern and manage the environment and the economy.
>
> Today, government and the public sector are not only legislators, managers, educators, administrators, but also economic motivators, consumers, regulators, and partners in the environment and economy. Government has traditionally attempted to address and resolve environmental, economic and social issues in isolation or relative isolation. It has failed to recognize the importance of linkages between them. This has resulted in agencies pursuing their own objectives while treating the impacts of their decisions on others as side effects while pursuing short-term benefits to the neglect of long-term implications and costs. Simply, the change needed involves integrating environmental and economic factors into decision making at all levels of the public sector.
>
> In practical terms, it means ensuring laws, administrative procedures, organizational structures, development policies, work practices, management systems and enforcement procedures are consistent with the principles and guidelines of sustainable development.
>
> Government must take a lead role in sustainable development by including the principles of sustainable development right across governmental departments and agencies.

12.2 The MFA response

The MFA devoted a chapter of the main report of the EIS to Project sustainability. In particular, the EIS notes that, "the Project is assessed with regard to its compatibility with *The Sustainable Development Act* (Manitoba), and in particular, the Manitoba Principles and Guidelines of Sustainable Development." The EIS reflects on each principle and guideline in the Act and provides discussion and examples on how the Project has applied those principles and guidelines in planning and Project design.

For example, with respect to the principle of integration of environmental and economic decisions the EIS states:

> The Floodway Expansion Project, from the outset in its conceptual definition, has balanced economic, environmental and social considerations. It is intended to avoid catastrophic social and economic losses, human health effects and social stress resulting from extreme flood events. A flood event in excess of the existing flood protection would be a disaster for Manitoba and Canada.

With respect to the principle of prevention, the EIS states:

> Potential significant adverse effects were avoided through the planning and design phases of the Project. For example, the deepening of the Floodway channel, as initially proposed, was almost completely eliminated to avoid environmental and social effects associated with groundwater use.
>
> MFEA has committed to ensuring adverse effects of the Project are prevented, mitigated or compensated.
>
> The Project is the subject of extensive environmental impact studies that, as reported in the environmental impact statements, have determined that no significant residual adverse effects are anticipated. Monitoring programs will be conducted during the construction and operational phases to determine if the predicted effects are as anticipated. Should the monitoring programs identify unacceptable unanticipated effects, appropriate mitigation will be implemented.

The EIS concludes that, "The Floodway Project is an excellent example of sustainable development; a Project that balances social and environmental benefits while protecting the welfare of future generations of Manitobans."

12.3 The public response

There were many requests by intervenors and participants for substantive licensing conditions covering wide ranging environmental and social issues, although there was general support for the performance enhancement of the Floodway. While there were few, if any, specific references to *The Sustainable Development Act*, many public comments related to sustainable development principles and directly challenged MFA evaluations respecting water related issues along the length of the Floodway Channel and social impacts arising from artificial flooding. In particular, there was concern about the loss of groundwater to the Floodway, contamination of the groundwater resource from the Floodway, and the detrimental economic, social, and mental health impacts on the lives of residents upstream of the Inlet Control Structure. Most of these comments were concerned with the on-going operations after the expansion is complete rather than the expansion Project itself.

12.4 Commission comment

The Commission takes the principles of sustainable development very seriously. These principles reflect government policy that has been the subject of extensive and wide-ranging discussion and review over an extended period of time. Adherence to these policies will, without doubt, lead to a more robust economy, healthier environment, and improved community and family life.

The Commission accepts and endorses the Project as one that enhances the safety and well-being of residents of Winnipeg. In addition to recommending licensing of the overall Project, the Commission is also recommending that the integrity of the Inlet Control Structure and its foundation be examined and confirmed. Failure of the structure or its foundation during a major flood could be catastrophic for Winnipeg and upstream residents.

The benefit that the Project will bring to Winnipeg contrasts with the potential impacts on upstream residents. The Project promises to reduce the frequency of artificial flooding, but the inherent design of the Project will see some artificial flooding. A design that might have reduced the risk of artificial flooding further would have involved channel deepening. Such a move would have led to greater and continuous impact on the groundwater resource since the unconfined Birds Hill aquifer could have been cut into more deeply and the loss of water from the otherwise confined bedrock aquifer would have been seriously exacerbated. Both the threat of artificial flooding and the threat to the groundwater resource that would accompany channel deepening were at odds with the principles and guidelines of sustainable development.

The Project which the Commission is recommending be licensed seeks both to protect the groundwater, by widening rather than deepening the channel, and to reduce the frequency and magnitude of artificial flooding by increasing the capacity of the Floodway. Both of these final design features are consistent with the principles of integrated environmental and economic decisions, stewardship, and shared responsibility and understanding. At the same time, the responsibility for compensation for those who will be affected by artificial flooding is an important one to be recognized and supported to the fullest extent, and the Commission is making several recommendations in this regard. The responsibility to ensure that such compensation takes place quickly and efficiently extends beyond the Minister of Conservation, who issues the licences, to the Minister of Water Stewardship, the minister responsible for the operation of the expanded Floodway, and to a number of other government departments.

The development during the expansion of the Floodway of recreational opportunities provided by the Project is also consistent with the guidelines of efficient use of resources, and integrated decision-making and planning. Development of recreational facilities after-the-fact would entail more expense and would be inconsistent with the Sustainable Development Guidelines. Overall, public participation (as advocated by the Guidelines) has taken place during the approval process for the MFA plan, and the MFA is to be commended for having taken this responsibility seriously. But this integrated approach should be extended to include recreational development.

Sustainable development does not imply that economic, environmental, and social considerations draw on the same capital. Rather, the results of development must "meet the needs of the present without compromising the ability of future generations to meet their own needs." The old saw that development can only proceed at the expense of the environment is simply not true; development can often be designed so that economic, environmental, and social considerations all win, at least to some degree. The hearings enabled proponents, intervenors, and other participants to achieve new awareness of the complexities associated with the proposed expansion of the Floodway. Technical issues, largely well described in the EIS but sometimes challenging to grasp, were carefully explained at the hearing. At the same time, social considerations were much more clearly understood following the care given to their description by intervenors and participants at the hearing. Mindful of the Principles and Guidelines of Sustainable Development, the Commission has formulated recommendations to address the concerns identified during the hearings to reflect the lessons learned and the needs expressed.

Chapter 13

Recommendations

This chapter contain all the recommendations contained in the preceding chapters. The recommendations are numbered based on the chapters in which they appear. In this chapter the recommendations are organized as being either licensing or non-licensing recommendations. The licensing recommendations are further categorized as to whether they apply to the licence to construct the Floodway expansion and maintain the expanded Floodway or to operate the expanded Floodway.

Licensing recommendations for Floodway expansion and maintenance

A licence to construct the Floodway expansion and maintain the expanded Floodway.

1.1 The Manitoba Floodway Authority be issued a licence to construct the proposed expansion of the Red River Floodway and maintain the expanded Red River Floodway, subject to licensing conditions outlined in subsequent recommendations in this report.

As a condition of a licence to expand and maintain the Floodway

7.1 The Manitoba Floodway Authority ensure that a comprehensive baseline study is completed with respect to groundwater quality and quantity along the full length of the Floodway. This baseline study shall include information regarding groundwater elevations, major ion chemistry, compounds of concern such as pesticides, and bacteriological analysis.

7.2 The Manitoba Floodway Authority develop a comprehensive ongoing groundwater-monitoring program based on the results of the baseline. It shall specify monitoring well depths and general locations.

7.3 The Manitoba Floodway Authority ensure that there is no additional groundwater leakage to the Floodway as a result of expansion.

7.4 The Manitoba Floodway Authority carry out a comprehensive Floodway-related health-risk assessment.

7.5 The Manitoba Floodway Authority establish procedures and protocols to deal with adverse water quantity and quality effects for the construction phase.

7.6 The Manitoba Floodway Authority

establish procedures and protocols to deal with adverse water quantity and quality effects needs for all phases of Floodway operations.

7.7 An arms-length appeal body be established to adjudicate claims regarding groundwater issues, this body to have the ability to respond quickly to public concerns regarding groundwater.

7.8 A peer review team be appointed which will review and comment on the following:

- The baseline information developed by the Manitoba Floodway Authority and the modelling carried out to date and recommend any further data collection and analysis they deem to be necessary.
- The ongoing monitoring programs proposed by the Manitoba Floodway Authority for both the construction period and over the long-term.
- The health-risk assessment carried out by the Manitoba Floodway Authority.
- Design and construction measures planned to prevent increased groundwater loss to the Floodway as a result of expansion.
- Techniques to be employed by the Manitoba Floodway Authority to prevent contamination of the Birds Hill and carbonate aquifer.
- The mitigation program proposed to be put in place by the Manitoba Floodway Authority.

The peer review team shall participate in pertinent committees and public meetings organized by the Manitoba Floodway Authority as part of the ongoing public-consultation process.

7.9 The Manitoba Floodway Authority provide an annual report on water quality monitoring to the Minister responsible. The report shall be available in the public registry and copies distributed to interested municipalities and members of the public.

7.10 The Manitoba Floodway Authority establish a public liaison committee.

9.1 The Manitoba Floodway Authority conduct a hydrogeological/ geotechnical investigation beneath the Inlet Control Structure to determine the soundness of present foundation conditions. This should include the drilling of inclined bore holes.

9.2 The Manitoba Floodway Authority install a minimum of three vertical groundwater multi-screen monitoring wells on each embankment at the Inlet Control Structure to define present groundwater conditions within Quaternary sediments (sand, gravel, till) at the contact of the Ordovician (bedrock) as well as within the Ordovician.

9.3 The Manitoba Floodway Authority undertake a review of the possibility of the control gates jamming as a result of differential settlement after the hydrogeological investigation recommended above is completed. The Manitoba Floodway Authority shall undertake any required remedial action.

9.4 The Manitoba Floodway Authority establish and execute a regular monitoring plan, designed to meet the requirements of the Canadian Dam Safety Association for surveillance of the intake structure and adjacent embankments.

9.5 The Manitoba Floodway Authority provide a report within six months of the issuance of the license outlining its response to the Draft Discussion Paper on Expert Workshop and the status of the implementation of the key observations and advice contained in the report. This report shall be placed on the Public Registry.

9.6 The Manitoba Floodway Authority implement the recommendations of the consultant's report contained in Appendix C of the Preliminary Engineering Report for Floodway Expansion. The recommendations are included as Appendix D of this report.

9.7 The Manitoba Floodway Authority prepare a Project Dam Safety Review as defined in the Canadian Dam Safety Guidelines during the final design phase of the project, including preparation of the required Project Dam Safety Program. The Dam Safety Program should meet all the requirements of the Canadian Dam Safety Association Guidelines including an Operation, Maintenance and Surveillance Plan, Breach Analysis, Emergency Preparedness Plans and Emergency Response Plans (which are to take into account water management at all water inflows and conditions resulting from various possible failure events with the inlet and the dykes).

9.8 The Manitoba Floodway Authority carry out such repairs and upgrades as may be identified in the Project Dam Safety Review on a priority basis and no later than the end of the third year after construction.

10.1 The Manitoba Floodway Authority work with interested parties through the Floodway Recreation Working Group to develop a recreation and landscaping plan for the Floodway. The Floodway Recreation Working Group should include representation from interested municipalities.

10.2 The Manitoba Floodway Authority develop a draft recreation and landscaping plan suitable for public presentation no later than the spring of 2006 and finalize the plan no later than the fall of 2006.

10.3 The Manitoba Floodway Authority set aside no less than one per cent of the total Floodway budget for the development and implementation of the recreation master plan. This one per cent shall be in addition to the cost of the Floodway interpretative Centre and enhancements to bridges for pedestrian and cyclist safety.

10.4 The Manitoba Floodway Authority ensure that design criteria for all new vehicle bridges include a requirement for safe passage for cyclists and pedestrians over and under each structure and/or facilitate safe passage by alternative means consistent with trail plans.

Licensing recommendations for Floodway operation

1.2 Manitoba Water Stewardship be issued a licence to operate the expanded Red River Floodway, subject to licensing conditions outlined in subsequent recommendations in this report.

As a condition of a licence to operate the Floodway

6.2 Manitoba Water Stewardship operate the Floodway in accordance with the approved operating rules, recognizing the Minister's right to unilaterally adjust the rules in emergency situations.

6.3 Manitoba Water Stewardship conduct public reviews of the operating rules at least once every five years. No new rule shall be adopted without first being submitted to public review. Except for changes made to the rules under emergency conditions, no rules shall be revised without first being submitted to public hearings. Any changes made to the existing rules in response to emergency conditions shall be submitted for such a public review within 12 months of the change.

6.5 Manitoba Water Stewardship be responsible for paying for and physically assisting the Rural Municipalities in the timely supply, delivery, and removal of sandbags to residents, farmsteads, and business structures that are at risk from artificial flooding.

6.11 Manitoba Water Stewardship, in each year in which there is a possibility that artificial flooding may have occurred, be required to have an independent third-party conduct a peer review of the report that must be prepared for the minister following any spring emergency operation of the Floodway. This review should be carried out within two weeks of the submission of the report.

6.12 Manitoba Water Stewardship ensure that individuals, businesses, and organizations affected by artificial flooding created by non-spring emergency operations be eligible for compensation on the same basis as claimants under *The Red River Floodway Act*.

Non-licensing recommendations

4.1 Guidelines for projects seeking a licence under *The Manitoba Environment Act* be more prescriptive as to what would constitute an acceptable cumulative effects assessment.

4.2 The practice of environmental assessment in Manitoba be enhanced by requiring higher standards of performance. In this regard, the Government of Manitoba should:

- Enact environmental assessment legislation.
- Provide comprehensive and clear guidance for proponents, consultants and practitioners.
- Establish protocols for best professional practice that includes cumulative effects assessment.

The environmental assessment process shall include use of traditional and local knowledge, selection of appropriate valued environmental components, establishment of baseline conditions, and establishment of thresholds in the conduct of environmental assessments. The protocols should reduce uncertainty, enhance effectiveness and improve predictability of future environmental assessments.

4.3 The Government of Manitoba facilitate a mandatory cumulative effects workshop with proponents and potential interveners, especially for projects likely to end up in a public hearings process.

6.1 The Manitoba Floodway Authority and Manitoba Water Stewardship post the operating rules, along with clear explanations of their implications on their websites. They should also publish this information in brochures to be distributed to residents of communities affected by Floodway operation. The information should be clear, accurate, and complete.

6.4 The MFA supply, transport, and place, free of charge, clean fill from the expanded Floodway excavation during construction to residents south of Floodway for backfilling of holes resulting from construction of mounds and dykes for flood proofing.

6.6 The Manitoba government ensure that no civil servant sit on Disaster Assistance Appeal Board panels hearing appeals under *The Red River Floodway Act*.

6.7 In the event of a flood that is accompanied by artificial flooding, staff from the Workers Compensation Board and Manitoba Public Insurance Corporation advocacy programs be seconded to the Manitoba Emergency Measure Organization to assist claimants in their appeals to the Disaster Assistance Appeal Board.

6.8 Once drafted, *The Red River Floodway Act* regulations be submitted to public review.

6.9 The Manitoba government either:

- factor the existing degree of uncertainty into its calculation in determining whether Floodway operations have led to artificial flooding in a manner that provides claimants under *The Red River Floodway Act* with the reasonable benefit of the doubt; or
- operate the Floodway in such a manner that results in the reasonable benefit of the doubt being given to upstream residents.

6.10 The Manitoba government take all appropriate steps to ensure that the definition of natural in *The Red River Floodway Act* conforms with the definition that was used by Acres Manitoba Limited in defining natural in 2004.

6.13 The Manitoba Floodway Authority develop a detailed plan for flood compensation downstream of the Floodway Outlet and circulate that plan for public discussion.

7.11 As a condition of its wastewater licence, the City of Winnipeg regularly monitor and report on the water quality of all City of Winnipeg outflows into the Red River Floodway Channel. These public reports shall be made on a quarterly basis. The City shall take remedial action when provincial water quality guidelines are violated.

8.1 The Manitoba government:

- Carry out an extensive review of historical ice-related flood levels at Selkirk.
- Better define ice conditions

around Selkirk through a field program that observes break-up and measures ice processes between the outlet of the Floodway and Lake Winnipeg.

8.2 The Manitoba Floodway Authority proceed immediately with its proposed riverbank monitoring program. The program should determine whether Floodway operation has any influence on river bank stability and establish an up-to-date baseline of the riverbank.

8.3 Where it is determined that expanded Floodway operation has caused or exacerbated riverbank failures, the Manitoba Floodway Authority should be responsible for riverbank remediation and stabilization.

10.5 The Manitoba Floodway Authority construct the drains on Floodway property and the outlet drop structures generally to the standards and elevations outlined in the EIS.

10.6 The Manitoba Floodway Authority work with the CCCD to determine and agree upon the long-term drainage needs of the CCCD including outlet drop structure elevations and build the necessary flexibility into their designs to adapt to the long term design requirements.

10.7 The Manitoba Floodway Authority investigate and provide a report to the CCCD on the need for and cost of additional drop structures as part of the final drainage design.

11.1 By 2015, the City of Winnipeg complete permanent raising of the primary dykes and needed improvements to control gates and pumping stations to allow the City to permit the safe passage of 2,270 m^3/s of water down the Red River.

11.2 The City of Winnipeg, the Government of Canada, and the Government of Manitoba work cooperatively toward the financing of improvements to Winnipeg's flood-control infrastructure.

11.3 The Manitoba government hire, train, retain, and properly resource skilled and experienced flood forecasters.

11.4 The Manitoba government ensure there is a sufficient, well-trained complement of staff available to deal with floods. The Manitoba government ensure that plans are in place to access and train additional staff for major floods.

11.5 The Manitoba Floodway Authority budget adequate and dedicated funding for the proper maintenance of flood-protection infrastructure.

11.6 Manitoba Water Stewardship budget adequate and dedicated funding for the proper maintenance of flood-protection infrastructure such as the Portage Diversion and the Shellmouth Dam.

11.7 The Manitoba Floodway Authority, Water Stewardship, the Manitoba Emergency Measures Organization, and all others involved in operating and maintaining the Floodway establish flood management procedures that clearly define their roles and responsibilities and budget requirements, to support the safe operation and maintenance of the Floodway.

Appendix A
Terms of Reference: Clean Environment Commission Public Hearing on the Red River Floodway Expansion Proposal

Background

On July 28, 2003 Manitoba Conservation received an Environment Act Proposal from the Floodway Expansion Management Authority respecting the proposed Red River Floodway Expansion. A cooperative provincial/federal review of the proposals is underway in accordance with the *Canada-Manitoba Agreement on Environmental Assessment Cooperation.* The review includes the preparation of an Environmental Impact Statement in accordance with Guidelines prepared by Manitoba and Canada and finalized after a public review. Environmental assessment for the project will be required pursuant to the requirements of the *Canadian Environmental Assessment Act.* It was also decided that the review would include a public hearing of the Clean Environment Commission (the Commission).

Mandate of the hearings

The Commission shall conduct a public hearing, in appropriate locations in Winnipeg and rural Manitoba as determined by the Commission, to consider the potential environmental, socioeconomic and cultural effects of the construction and operation of the Red River Floodway Expansion Project.

The Commission shall conduct the hearing in general accordance with its *Process Guidelines Respecting Public Hearings* which include procedures for Pre-Hearing Meetings or Conferences and Proprietary Information.

Following the public hearing the Commission shall provide a report to the Minister of Conservation pursuant to Section 7(3) of *The Environment Act.*

The Commission may, at any time, request that the Minister of Conservation review or clarify these Terms of Reference.

Scope of the review

For the potential environmental, socio-economic, and cultural effects of the Proposal, the Commission shall consider the Environmental Impact Statement and public concerns, and provide a recommendation on whether an Environment Act Licence should be issued to the Floodway Expansion Management Authority for the Red River Floodway Expansion Proposal.

Should the Commission recommend the issuance of an Environment Act Licence for the Proposal, then appropriate recommendations should be provided respecting:

- Measures proposed to mitigate any adverse environmental, socio-economic, and cultural effects resulting from the Red River Floodway Expansion project and where appropriate, to manage any residual adverse effects; and
- Future monitoring and research that may be recommended in relation to the project.

The Clean Environment Commission's recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *Sustainable Development Strategy for Manitoba.*

September, 2003

Appendix B
Presenters to the hearing

Allen, Bruce, Private

Arklie, Hugh, Private

Arthur, Jim, Rivers West - Red River Corridor Assoc. Inc.

Baird, Vaughan, Private

Bartmanovich, Rita, Private

Bert, Smith, Manitoba Floodway Authority

Bezan, James, MP Selkirk-Interlake

Bodnaruk, Bob, Private

Bugera, Murielle, Crow Wing Trail Association

Buhler, Jake, Cooks Creek Conservation District

Carson, Rick, Manitoba Floodway Authority

Chicoine, Daryl, Cooks Creek Conservation District

Chorney, Doug, Coalition for Flood Protection North of the Floodway

Cieskiewicz, Allan, Private

Clifton, Maxine, Private

Clifton, Paul, Private

Clifton, Wayne, Coalition for Flood Protection North of the Floodway

Corp, John, Private

Crooks, Lloyd, Cooks Creek Conservation District

Curry, Orvel, R.Ms of Springfield, St. Clement, East St. Paul

Danyluk, David, Save Our Seine

Dearman, Cliff, Rural Municipality of West St. Paul

Doering, Jay, University of Manitoba

Dubinsky, Ron, Cooks Creek Conservation District

Duerksen, Robert, 768 Association

Dzus, Rosemary, Manitoba Recreational Trails Association

Ford, Doug, Private

Frank, Jeff, River West - Red River Corridor Assoc. Inc.

Friedman-Hamm, Marci, Manitoba Floodway Authority

Galloway, Bob, Anola Community Enhancement Association

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Appendix C
Acronyms

ALARA: as-low-as-reasonably-achievable

ASL: above sea level

CCCD Cooks Creek Conservation District

CEA: Cumulative effects assessment

CEAA: *Canadian Environmental Assessment Act*

CEMR: Central Manitoba Railway

cfs: cubic feet per second

CPEP Construction Phase Environmental Protection Plan

EMO: Manitoba Emergency Measures Organization

DFA: Disaster Financial Assistance

EIA: Environmental Impact Assessment

EIS: Environmental Impact Statement

GUDI: Groundwater Under the Direct Influence of Surface Water

IJC: International Joint Commission

JAPSD: James Avenue Pumping Station Datum

m^3/s: cubic metres per second

MFA: Manitoba Floodway Authority

MFEA: Manitoba Floodway Expansion Authority

MFEMA: Manitoba Floodway Expansion Management Authority

MMF: Manitoba Metis Federation

MPIC: Manitoba Public Insurance Corporation

NRAC: North Ritchot Action Committee

PAT: Project Administration Team

PDEA Project Definition and Environmental Assessment

RCCC: Ritchot Concerned Citizens Committee

RM: rural municipality

RRFTC: Red River Floodway Trail Coalition

SOS: Save Our Seine

TAC: Technical Advisory Committee

TCMW: Tobacco Creek Model Watershed

VEC: Valued Eco-system Component

WCB: Workers Compensation Board

Appendix D

Dam safety discussion and recommendations from Appendix C, Preliminary Engineering Report

The key observations from the dam safety and related investigation include:

1. The dam safety investigations indicate that the Inlet Control Structure, adjoining dykes and the Inlet Control Gates are generally in good condition.
2. The significant program of detailed inspections and major maintenance that has been undertaken recently on the Inlet Control Structure has restored most of the equipment to good condition. Remaining major maintenance including repairs to the hoist piston rods, cylinder crosshead guides should be undertaken as soon as practical.
3. In accordance with CDA [Canadian Dam Safety Association] criteria and an informal assessment, it is recommended that the facility should be classified as a "Very High" consequence category. This would typically result in selection of the PMF [Probable Maximim Flood] as the Inflow Design Flood. However, because of the specific characteristics of the Floodway project, floods of lower magnitude are much more critical from a dam safety perspective.
4. A brief review of the potential range for the PMF indicates that the combined discharge capacity of the Inlet Control Structure and Floodway Channel would very likely be exceeded for floods significantly lower than the PMF.
5. The factors of safety and design for the embankments and concrete structures generally exceed the maximum criteria indicated in the CDA Dam Safety Guidelines. The addition of seismic loadings appropriate to this region does not reduce safety margins below acceptable values for the unusual conditions.
6. Freeboard in the East Dyke and West Embankment is currently deficient in four local areas for a design upstream water level of 237.13 m (778 ft) at the Inlet Control Structure. The most significant deficiencies occur opposite the two recently created East Embankment gaps and on the East Dyke between the Inlet Control Structure and St. Mary's Road. These deficiencies should be corrected as a priority. Preliminary designs for remedial measures have been prepared by the Floodway Channel Consultant. Our review indicates that these measures will remedy the deficiencies from a dam safety perspective.
7. Provisions for additional discharge capacity by breaching selected areas at the West Dyke, consistent with previously established concepts, can be incorporated economically and should be implemented. The primary benefits will be avoidance of incremental flooding upstream and the ability to prevent uncontrolled increases in upstream water levels for extreme situations.

8. Under certain circumstances involving operation of the design upstream water level at 237.13 m (778 ft), the Inlet Control Gates might not have sufficient range of travel to maintain discharge within acceptable limits. These situations could include:

   - Significantly above average Assiniboine River contributions.
   - Wind setups at the inlet for extreme wind conditions.

9. Some areas of embankment erosion protection immediately adjacent to the Inlet Control Structure are deficient in design and/or construction. Remedial measures have been identified and should be incorporated.

10. Assuming that remaining identified maintenance work on the Inlet Control Gates and hoists is completed, the Inlet Control Gates will be in relatively good condition. Additional measures to improve reliability and redundancy have been identified and recommended in Sections 3.1.8, 3.1.9 and 3.2.3.

11. The existing Operations and Maintenance Manuals and procedures are not compliant with the CDA Guidelines. Comprehensive Operation, Maintenance and Surveillance [OMS]procedures and an OMS manual should be prepared and implemented as a priority.

12. The preliminary West Dyke designs prepared by the West Dyke Consultant have been reviewed and, with relatively minor comment that can be readily incorporated in the final design, are acceptable from a Dam Safety perspective. Some potential opportunities to reduce costs or optimize the functionality have been identified in Section 3.2.1.

13. An Emergency Preparedness Plan should be developed as a priority.

14. Dam safety reviews should be conducted at intervals of not more than 5 years in accordance with the CDA Dam Safety Guidelines for Very High consequence classification structures.

There are several specific and detailed recommendations contained in the previous sections of this Appendix that should be incorporated in the final design stage of the Floodway Expansion Project.

Appendix E
Principles and Guidelines of Sustainable Development

Principles:

1. Integration of Environmental and Economic Decisions

1(1) Economic decisions should adequately reflect environmental, human health and social effects.

1(2) Environmental and health initiatives should adequately take into account economic, human health and social consequences.

2. Stewardship

2(1) The economy, environment, human health and social well-being should be managed for the equal benefit of present and future generations.

2(2) Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.

2(3) Today's decisions are to be balanced with tomorrow's effects.

3. Shared Responsibility and Understanding

3(1) Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation.

3(2) Manitobans share a common economic, physical and social environment.

3(3) Manitobans should understand and respect differing economic and social views, values, traditions and aspirations.

3(4) Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including Aboriginal peoples, to facilitate equitable management of Manitoba's common resources.

4. Prevention

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

5. Conservation and Enhancement

Manitobans should

(a) maintain the ecological processes, biological diversity and life-support systems of the environment;

(b) harvest renewable resources on a sustainable yield basis;

(c) make wise and efficient use of renewable and non-renewable resources; and

(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.

6. Rehabilitation and Reclamation

Manitobans should

(a) endeavour to repair damage to or degradation of the environment; and

(b) consider the need for rehabilitation and reclamation in future decisions and actions.

7. Global Responsibility

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision making while developing comprehensive and equitable solutions to problems.

Guidelines:

1. Efficient Use of Resources – which means

(a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and

(b) employing full-cost accounting to provide better information for decision makers.

2. Public Participation – which means

(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;

(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and

(c) striving to achieve consensus amongst citizens with regard to decisions affecting them.

3. Access to Information – which means

(a) encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and

(b) promoting the opportunity for equal and timely access to information by all Manitobans.

4. Integrated Decision-Making and Planning – which means

encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral and which incorporate an inter-generational perspective of future needs and consequences.

5. Waste Minimization and Substitution – which means

(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and

(b) reducing, reusing, recycling and recovering the products of society.

6. Research and Innovation – which means

encouraging and assisting the researching, development, application and sharing of knowledge and technologies which further our economic, environmental, human health and social well-being.